1992

Improving Long-Term Adherence to Fluid Restrictions in Hemodialysis Patients.

Kevin Dale Everett
Louisiana State University and Agricultural & Mechanical College

Order Number 9302897

Improving long-term adherence to fluid restrictions in hemodialysis patients

Everett, Kevin Dale, Ph.D.

The Louisiana State University and Agricultural and Mechanical Col., 1992

U·M·I
300 N. Zeeb Rd.
Ann Arbor, MI 48106

IMPROVING LONG-TERM ADHERENCE TO FLUID RESTRICTIONS IN HEMODIALYSIS PATIENTS

A Dissertation

Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy

in

The Department of Psychology

by
Kevin D. Everett
B.A., University of Missouri, 1986
M.A., Louisiana State University, 1989
August, 1992

ACKNOWLEDGEMENTS

At this time I would like to acknowledge and thank a number of individuals for their support and assistance during the course of completing my dissertation.

First, I would like to thank my committee members for their service and guidance during this project. These individuals included Phillip J. Brantley, Ph.D., W. Drew Gouvier, Ph.D., Mary Lou Kelley, Ph.D., Arthur Riopelle, Ph.D., William F. Waters, Ph.D., and Don Franks, Ph.D. A special recognition goes to Dr. Brantley, my major professor, who has contributed significantly to my professional development by motivating me to work at my highest level and always supporting my effort.

I am grateful for the dedication of Christopher Sletten and Cindy Carmack in collecting data for this project. I thank these two future psychologists for their assistance, and their valued friendships. Additionally, I would like to acknowledge and thank Glenn Jones, Ph.D. for providing invaluable consultation and advice during this project. A special thanks to good friends Debbie Miller and Brad Thomason for modeling the type of student I should have been, and for helping to make this "process" manageable.

And finally, I thank my wife, Laurie, and my family for all of the love, understanding, and support given to me during this time. I couldn't have done it without you.

TABLE OF CONTENTS

LIST OF TABLES

ABSTRACT

The goals of this project were to investigate factors that predicted nonadherence to fluid restrictions for patients on hemodialysis, and to evaluate a relatively long-term behavioral intervention to improve adherence to recommended fluid requirements. One hundred forty-one subjects were recruited from outpatient dialysis clinics in Baton Rouge, Louisiana. In the prediction study, several medical and demographic variables as well as psychological variables of health locus of control, depressed mood, and social support were placed into a regression equation to determine the variance of fluid noncompliance predicted. It was found that variables of being male, educated, younger, and having an external health locus control based upon chance beliefs were significantly predictive of noncompliance. In a separate six-month prospective study, no statistically significant improvements were observed when comparing a group rewarded contingently for fluid compliance to a group receiving noncontingent reward. Low rates of reinforcement during the treatment and participant characteristics are discussed as reasons for the lack of behavior change towards treatment adherence.

INTRODUCTION

The formidable success of the health care system in the control of infectious disease makes it certain that the ongoing emphasis will be on the improvement, maintenance, rehabilitation, and palliation of chronic conditions (German, 1988). End-Stage Renal Disease (ESRD) patients are representative of a chronically ill population that is growing in numbers. Increasingly these patients are able to have kidney transplants; however, the vast majority are treated with some form of dialysis. Eighty-five percent of patients on dialysis were maintained by hemodialysis in 1987 (Lazarus & Hakim, 1991) and in 1990 over 100,000 patients received maintenance dialysis (Jameson & Wiegmann, 1990).

Maintenance treatment is costly in terms of dollars, estimated to be over 3.1 billion dollars annually (Eggers, 1988) and in the psychosocial costs involved in lifestyle changes (Kirschenbaum, Sherman, & Renrod, 1987). While extending lives, the hemodialysis treatment regimen is complex and rigorous. Along with lengthy treatment sessions, the patient must comply with numerous dietary restrictions and take supplemental medications to prevent serious health consequences. The many disruptions of normal life activities frequently result in psychological problems such that ESRD has been characterized as a "living stress laboratory" for studying chronic illness (Devins, Binik, Hollonby, Barre, & Guttman, 1981).

The effectiveness of treatment for a chronic disease depends on two factors: the efficacy of treatment and the rate of adherence or compliance to treatment (Epstein & Cluss, 1982). As the technology and efficacy of dialyzing procedures improve, methods to increase adherence to non-dialyzing aspects of the treatment regimen (e.g., dietary restrictions) have become increasingly important for adequate medical management. The introduction to this paper examines the relevant issues in renal failure, specifically hemodialysis and dietary requirements. Highlighted in this description are the relevant dietary measures of compliance to hemodialysis treatment. Factors related to compliance and compliance intervention studies are also reviewed. Finally, two studies were conducted, the first evaluating variables that predicted noncompliance to hemodialysis regimen fluid restrictions and the second using an intervention strategy of behavioral contracting to improve compliance to fluid restrictions.

End-stage Renal Disease

End-stage renal disease (ESRD) refers to irreversible failure of the excretory function of the kidneys (Stodola & Miller, 1989). This loss of functioning is usually progressive and irreversible, with onset often going undetected for a long time. Kokko (1988) reviewed data related to causes of chronic renal failure in North American patients on maintenance hemodialysis. Glomerulonephritis, a heterogeneous group of renal disorders, has been implicated as the primary cause of chronic renal failure in 41.6% of the patients. Cardiovascular diseases and hypertension accounted for 13.5% of cases. Other disorders associated with renal failure have included: urinary tract diseases in 10.5%; unknown causes in 8.4%; congenital abnormalities in 7.6%; diabetes in 7.2%; kidney infection in 6.1%; and other factors in 5.1%.

As mentioned above, the insidious nature of most kidney diseases often allows patients to remain symptom-free until late in the disease process. It is noted that younger patients can function with as little as one-tenth of their normal renal functioning (Cameron, 1986). However, when renal functioning decreases to 20 to 25% of normal functioning, a conglomeration of clinical symptoms and physiological changes are noticed. These are referred to as the uremic syndrome.

The Uremic Syndrome

The uremic syndrome is attributed to a chemical derangement in the composition and volume of body fluids. The nitrogenous end-products of protein and purine metabolism are toxic to the body and are normally excreted in the urine. However, if they are allowed to accumulate in the blood, they can result in impairment in all bodily systems. The clinical manifestations of uremia can be diverse, and not all have been explained by the accumulation of known compounds (Bergstrom & Furst, 1983). Components of the uremic syndrome and the systems affected include: (a) disturbances in metabolism of water, electrolyte, and acid-base with imbalances in potassium, sodium, uric acids, chloride, calcium, phosphate, magnesium, and other acid-base concentrations; (b) abnormalities in cardiovascular functioning with problems relating to hypertension, pericarditis, and atherosclerosis; (c) gastrointestinal problems with symptoms of anorexia, vomiting, nausea, and hiccups are early clinical manifestations of uremia, with additional gastrointestinal problems include glossitis, gastritis, and enterocolitis; (d) hematological abnormalities, most frequently anemia; (e) parathyroid and bone abnormalities with problems of osteitis fibrosa, osteosclerosis, and osteomalacia leading to "renal osteodystrophy"; (f) increased rates of infection due to reduced immune function; (g) neuropathy related to dysfunction in both the peripheral and central nervous systems; (h) endocrine abnormalities frequently reduce levels of testosterone and estrogens; (i) Metabolic abnormalities involving carbohydrates, lipids, and proteins result in respective problems of glucose intolerance, hyperlipidemia, and myopathy; (j) integument disorders involving pigmentation changes and pruritis (Cameron, 1986).

Maintenance Dialysis

Extracorporeal hemodialysis and peritoneal dialysis serve as treatment procedures to remove the accumulated metabolic waste products from the blood. Restoration of water, electrolyte, and acid-base balance is accomplished in these treatments through diffusion processes. The use of a synthetic membrane (extracorporeal hemodialysis) or the peritoneal membrane within the abdominal cavity (peritoneal dialysis) involves diffusion down a concentration gradient and across a semipermeable membrane. This allows particles to be selected according to their molecular weights. Concentration and content of blood solutes can be achieved in this way. This process is different from normal kidney filtration which removes solutes by osmosis and pressure filtrations across its capillary walls (Luke, 1988). This discussion of dialysis will be restricted to extracorporeal dialysis or hemodialysis because the current study includes only these patients.

Extracorporeal hemodialysis requires access to the circulatory system and an "artificial kidney". The access can involve either an internal or an external device to shunt the blood between an artery and vein. The blood is filtered through an "artificial kidney" which allows for exchange of solutes across a semipermeable membrane in a dialyzing fluid that is similar in composition to normal plasma. Unlike the continual cleansing and restoring functions of the kidneys, dialysis is typically conducted for three to four hours per treatment with three sessions per week (Lazarus, 1981). Over 95% of maintenance hemodialysis treatments are performed in outpatient clinic settings (Kirschenbaum, et al., 1987). Clinic settings are typically staffed by nephrologists, nurses, social workers, dieticians, and machine technicians. The remaining percentage of hemodialysis patients receive treatment in their homes.

Between dialysis sessions, fluids and waste products from diet will accumulate. This contributes to an electrolyte imbalance that can lead to symptoms of uremia. Patients are advised to avoid specific food groups and maintain a specific level of fluid and caloric intake. Additionally, supplemental vitamins and minerals are necessary because dialysis treatment will remove these from the blood (Rodriquez and Hunter, 1981). Dietary requirements of dialysis patients will be discussed.

Dietary Requirements of Hemodialysis Patients

Compliance with dietary restrictions is probably the most difficult part of the medical regimen of hemodialysis patients because it affects long-standing personal habits and alters life-style significantly (Hoover, 1989). Compliance with dietary recommendations is important for the hemodialysis patient because deviations from the prescribed diet may result in a number of short- and long-term physical problems. This section will be concerned with describing the specific dietary restrictions and the complications which arise with noncompliance.

The major dietary modification in hemodialysis patients is the restriction of protein intake to prevent or reduce the accumulation of nitrogenous byproducts (Kopple, 1984). Blood urea nitrogen (BUN) is the primary waste product of protein and amino acid metabolism. A primary goal of dietary therapy is to maintain a BUN concentration below 90 mg/dl (Wolfson, 1984). The recommended intake of protein is 1.0 to 1.2 g/kg of body weight per day. Additionally, adequate caloric intake must be maintained to spare endogenous protein from being the main source of energy. The recommended daily intake of calories is 35 kcal/kg of body weight (Rodriguez & Hunter, 1981).

Potassium is a mineral necessary for the normal functioning of the nerves and muscles, particularly the heart. It is not effectively dialyzed and therefore must be limited to 45 to 70 mEq/L per day. The potassium content of many foods is linked to their protein content. Certain foods are particularly high in potassium and should be avoided. Citrus fruits, beans, potatoes, and nuts are examples of foods that can lead to hyperkalemia. Hyperkalemia, a greater than normal concentration of potassium ions, can result in cardiac arrhythmias. Serum levels over 8 mEq/L may result in cardiac arrest (Andreoli, 1985).

Phosphorus and calcium are two minerals important in the formation of bones. The maintenance of a pre-dialysis serum phosphorus concentration of 4 to 5.5 mg/dl is a key aim of dietary therapy (Feinstein, 1986). With much of the phosphorous intake linked to daily protein requirements, 1200 to 1500 mg of phosphorus may be ingested. High phosphorus food such as dairy products should be avoided, but dietary restriction is not sufficient. Most patients are placed on phosphate-binding medications. Frequently compliance with taking these binders is reduced because they are disagreeable in taste, cause the mouth to dry, and are constipating. Supplementation of calcium is frequently necessary as calcium absorption in dialysis patients is impaired, and decreased levels of calcium can contribute to problems of renal osteodystrophy (Kokko, 1988).

Sodium restrictions are important for patients with edema or hypertension, but are not necessary for patients who do not experience hypertension or fluid overload. Increased salt intake is, however, frequently accompanied by thirst and fluid ingestion. The recommended sodium intake is 2 to 4 grams and the failure to comply can lead to problems of edema, hypertension, and congestive heart failure (Rodriguez & Hunter, 1981).

Fluid intake must be carefully monitored and controlled to keep pace with the kidney's elimination abilities (Cummings, Kirscht, Becker, & Levin, 1984). The daily fluid intake for hemodialysis patients should be between 700 and 1500 ml (Kopple, 1984; Feinstein, 1986). Although excessive water intake accompanies the ingestion of salt, there are other factors that stimulate water intake such as medications (e.g., aluminum hydroxide tablets cause dryness and a chalky taste) and hyperglycemia in diabetics. Finally, psychologic and social influences are difficult to counteract. Excessive fluid intake may result in shortness of breath, and uncomfortable dialysis sessions accompanied by dizziness, nausea, and vomiting. More serious complications are pulmonary edema and congestive heart failure (Robertson & Berl, 1986).

In summary, dietary modification is a necessary component of comprehensive dialysis treatment. Compliance to dietary requests can prevent or limit many problems. Noncompliance to aspects of the diet can have severe health consequences for those patients undergoing routine hemodialysis.

Complications Associated with Hemodialysis

The normal kidney performs its vital functions continuously. The "artificial kidney" of hemodialysis must accomplish the same task in a significantly reduced amount of time. Patients on maintenance hemodialysis will require medical attention for iatrogenic complications of the treatment, as well as for the previously described abnormalities in body system functions due to persistent uremia. A universal medical complication of treatment by hemodialysis is anemia (Eschbach, 1983). The dialysis procedure can cause blood loss, cell destruction, as well as reduced erythropoiesis that will contribute to anemia (Delano, 1983).

Cardiovascular complications remain the leading cause of death for dialysis patients. Hypertension is the most common cardiovascular disorder and is a predisposing factor for many cardiovascular problems. For most patients hypertension is volume-dependent and can be controlled by water/salt regulation.

Antihypertensives must be administered to noncompliant patients. Pericarditis is a life-threatening complication of terminal uremia and can remain a problem for those on chronic dialysis (Comty & Shapiro, 1983).

Episodes of hypotension, muscle cramping, and problems of anticoagulation can be byproducts of the dialysis session. The drop in blood pressure associated with hypotension may cause a patient to experience dizziness, malaise, nausea, and unexplained anxiety. Hypotension appears to be related to the rapid removal of fluid from the body. Approximately 20 to 30% of hemodialysis sessions involve symptomatic hypotension (Blagg, 1983). Painful muscle cramps can occur during and between sessions and are thought to be due to rapid removal of extracellular fluid and changes in concentrations of sodium in the muscle cell (Battista, 1979). Anticoagulants, such as heparin, are used to prevent clotting of the vascular access. Complications include spontaneous bleeding in the gastrointestinal tract, pericardium, pluera, joints, retroperitoneal space, and cerebrum (Butt, 1983).

Infection is the second most common cause of hospitalization in maintenance dialysis patients other than cardiac complications (Hirschman, 1981). Infections of the vascular access, respiratory infections, urinary tract infections, septic arthritis, and viral hepatitis are common (Palakoff, 1983; Butt, 1983).

Renal osteodystrophy is a term that describes the many skeletal abnormalities that can be manifested in patients on maintenance dialysis. These abnormalities include skeletal pain, muscular weakness, bone deformities, periarthritis, and altered biochemistry and can be caused by hyperparathyroidism. Medical management consists of maintaining proper blood chemistries, adhering to dietary restrictions, using vitamin D supplements, and as a last resort, performing partial parathyroidectomy (Kokko, 1988).

Peripheral neuropathy is a frequent problem for dialysis patients. The neuropathy found in dialysis patients is similar to that found in patients with diabetes. Repeated dialysis treatments will halt the progression of, but will not ameliorate, previously existing neuropathy (Lazarus, 1981). Other neurological complications can occur in dialysis patients. Dialysis Disequilibrium Syndrome occurs as a result of severe azotemia (increased nitrogen in the bloodstream). Symptoms include headache, nausea and vomiting, blurred vision, disorientation, restlessness, and muscle cramps (Jennekins & Jennikens-Schinkel, 1983; Longo,1981; Salmons, 1980). Additional uremic symptoms that are not relieved with maintenance dialysis include insomnia, restlessness, and pruritus. These symptoms are recurrent and largely unresponsive to treatment (Cameron, 1986).

Psychological problems are a common occurrence in patients undergoing hemodialysis. Frequently reported problems include depression (Stewart, 1985), anxiety (Salmons, 1980), suicide (Haenel, Brunner, & Battegay, 1980), sexual dysfunctions (Golden & Milne, 1978; Bommer, Tschope, Ritz, & Andrassy, 1976), and neuropsychological deficits (Delano, 1983). Depression has been the most commonly observed psychological complication in hemodialysis patients (Burton, Kline, Lindsay, & Heidenheim, 1986; Devins, Binik, Hollomby, Barre, & Guttmann, 1981; Kutner, Fair, & Kutner, 1985).

The stressful and complex treatment regimen that dialysis patients must follow increases the probability of medical noncompliance and subsequent health problems. Abuse of the prescribed diet results in a direct mortality rate estimated to be 4-14% (DeNour, 1982) and mortality related to refusal of treatment and failure to attend dialysis sessions range from 1-20% (Abrams, 1974). The search for identifiable variables of patients at risk for noncompliance has yielded inconclusive results, but is ongoing (Ferraro, Dixon, & Kinlaw, 1986; Brantley, Mosley, Jones, & Cocke, 1990). The following section will define compliance to medical treatment and the different methods utilized to measure compliance variables.

Compliance in Chronic Disease

The topic of patient compliance with medical advice and prescription has been recognized formally for over 50 years, and noncompliance continues to be considered a major impediment to effective health care delivery. From early studies in compliance

DiMatteo & DiNicola (1982) conclude the following: (1) Preventive behaviors have higher levels of noncompliance than direct care behaviors; (2) Conditions of long duration are associated with less compliance; and (3) Complex treatment regimens, multiple conditions, and many prescribed drugs all are associated with noncompliance. This description of characteristics fits with most chronically ill populations, such as ESRD patients, and emphasizes the need to define compliance and discuss measurement issues.

In a book entitled "Compliance in Health Care" by Haynes, Taylor, & Sackett (1979) one of the first general definitions of compliance is given. These authors define compliance as:

> "The extent to which a person's behavior (in terms of taking medications, following diets, or executing lifestyle changes) coincides with medical or health advice" (Haynes, 1979).

This parsimonious definition is often difficult to operationalize, and other definitions have followed. Often the term "adherence" is used to describe how a patient follows medical recommendations. Some researchers believe this word implies a collaborative and interactional relation between patient and health care provider comparative to the term compliance, which some believe suggests the patient is a passive responder to authoritarian medical demands (Turk, Salovey, & Litt, 1986). In this discussion the terms will be used interchangeably. A number of variables may affect the rate of compliance including, for example, the specific medical population in question, the medical treatment regimen, and the methods of compliance measurement utilized.

General compliance methods have been placed in rank ordering from objective/direct methods to subjective/indirect methods by Rapoff and Christophersen (1982). Assays (e.g., urine, blood) and observation methods are considered the most objective. Pill counts, treatment outcome, physician estimates, and finally patient self-report are considered progressively less objective. Each method of measurement has strengths and weaknesses. Biochemical assays are the most sophisticated, objective, and reliable method of measurement. These methods can be expensive and therefore impractical in comparison to other measurement methods. Self-report and physician ratings are easily obtained and inexpensive methods of obtaining compliance data; However, social desirability and other factors have consistently led to overrating compliance behaviors compared to biochemical assays or other objective measurement (Cummings, et al., 1984; Caron & Roth, 1968; Soutter & Kennedy, 1974; Sheiner, Rosenberg, Marathe, & Peck, 1974; Haynes, et al., 1976; Mazur, 1981). In general, reviews of compliance literature suggest that biochemical assays are the best choice for assessment (Epstein & Cluss, 1982; Mazur, 1981; Gerber, 1986).

Compliance in Hemodialysis Patients

Definition and Measurement Issues. Compliance in hemodialysis populations is not unlike the many other medical populations studied in that definition, and measurement methods have varied considerably (Ferraro, et al., 1986). Measurement of compliance to the hemodialysis treatment regimen focuses primarily on dietary/fluid requirements and taking prescribed medications. Methods of assessing compliance have included laboratory assays, recordings of inter-session weight gain (IWG), and self-reports of patients and staff (Wolcott, Maida, Diamond, & Nissenson, 1986). Each of these methods proposes to discriminate between treatment compliance and noncompliance. As in the general compliance literature, objective measures, self-report, and staff reports have demonstrated minimal consistency, and varying levels of compliance are reported depending on the method used.

Several factors have made it difficult to provide a general definition of compliance in dialysis patients. The number of operational definitions used almost equals the number of studies conducted in this area. Researchers who publish in this area have been found to change their definition of compliance across studies (e.g., Procci, 1978; Procci, 1981; DeNour & Czaczkes, 1972; DeNour & Czaczkes, 1976). Within this study area differences exist in the number of variables measured, the time over which compliance variables are measured, the summary statistic utilized, and the criterion or cut-off values for compliance. Relevant issues concerning these differences will be discussed.

Although some researchers have recommended a multi-method approach to measuring compliance (Cummings, et al., 1984), the majority of researchers in this area have employed physiological assessments as the only method or one of multiple methods of measuring compliance. These measures are considered the most reliable and least biased of compliance measures compared to staff or patient self-report (Blackburn, 1977; Witenberg, Blanchard, McCoy, Suls, & McGoldrick, 1983). In separate reviews concerning measuring compliance in hemodialysis patients, the most commonly reported objective compliance measures were: potassium, BUN, phosphorus, and IWG (Ferraro, et al., 1986; Wolcott, et al., 1986; Binik, Devins, & Orme, 1989). Other measures include diastolic blood pressure and patient attendance.

Even when researchers use objective laboratory measures of compliance, there have been considerable differences in the number of variables utilized. Ferraro et al. (1986) found nine empirical studies that used quantitative measures of compliance based on laboratory values, and the number of compliance variables ranged from one (Yanagida, et al., 1981) to five (Kiriloff, 1981). Only IWG was used in every study, and potassium was used in all but one of these investigations. In a similar review by Binik, Devins, &

Orme (1989), twelve studies were presented, and IWG was the only variable measured in all studies.

Establishing an appropriate baseline for parameters of compliance will increase reliability of data and multiple measures of dietary variables across time should be employed instead of single data points (Ruggerio, 1988). In previous studies, the length of time in which baseline assessment measures of compliance were collected ranged from a single week and single measurement (e.g., Cummings, et al., 1984) up to a 14-month period with multiple measurements (e.g., Blackburn, 1977). Some investigators used a mean value to summarize the collected data and classified patients by comparison of this mean for each parameter to a specified range or upper cut-off value indicating compliance (Hartman & Becker, 1978; Cummings, et al., 1982; Procci, 1981). Other studies examined the percentage of time a patient's physiological values fell within a range or cut-off to determine their compliance level (Blackburn, 1977; Cheek, 1982; Yanagida, 1981).

A factor that confuses the actual rate of noncompliance in this population is the numerous criterion ranges or cut-off levels used to define compliance across studies measuring the same physiological parameter (Ferraro, et al., 1986; Wolcott, et al., 1986; Binik, et al., 1989). The most commonly reported measures are potassium, phosphorus, and IWG. The upper cut-off for potassium which indicated compliance ranged from 5.0 mEq/L (e.g., Blackburn, 1977;

Cheek, 1982) to 6.0 mEq/L (Procci, 1981). The upper cut-off for phosphorus ranged from 4.5mg/100ml (e.g., Cheek, 1982) to 5.5mg/100ml (e.g., Cummings, et al., 1982). The upper criteria for compliance as measured by IWG generally ranged from .9 kg (Procci, 1978) to 3.0 kg (e.g., Cummings, et al., 1982). For individual treatment cases reported, IWG criteria has had even greater variability with ranges of .45 kg (Finn et al., 1985) to 3.5 kg (Keane, et al., 1981). Only two of 12 studies reviewed by Binik, et al. (1989) controlled for residual kidney function when measuring IWG.

Many researchers dichotomously classify their patients into compliant and noncompliant groups. DeNour and Czaczkes (1972) developed criteria that frequently have been used in dialysis compliance studies. This comprehensive set of criteria classify patients into five possible groups based on different degrees of compliance. Patients receive a compliance rating ranging from "excellent" (IWG never above 500g; predialysis serum potassium levels never above 6 mEq/L and steady predialysis BUN levels) to "great abuse" (IWG always greater than 2kg; predialysis potassium greater than 7 mEq/L). Other researchers have developed similar rating scales (Procci, 1978; Seime, 1980). This approach has received criticism for reducing measurement sensitivity by dichotomizing a metric variable. Furthermore, many argue that compliance is best considered as a continuous rather than categorical phenomenon (e.g., Ferraro, et al., 1986).

While these scales facilitate research by providing reproducible criteria for assessment, they have been constructed on the basis of presumed appropriate levels, without reference to a survey of the actual range and distribution of clinical data (Manley & Sweeney, 1986). A common finding of studies using these scales has been a high rate of noncompliance. Comparing data from several studies indicates the mean IWG was often over 2 kg (Ferraro, et al., 1986; Manley & Sweeney, 1986; Cummings, et al., 1984), suggesting that an empirical investigation into fluid weight gain and concomitant medical symptoms/problems might best determine reasonable compliance parameters. In recent studies IWG criteria have been set after "consultation with medical staff" (Ferraro, et al., 1986).

The problems mentioned above limit the accuracy of reported compliance rates. Studies have reported compliance rates in terms of developed criteria (e.g., DeNour & Czaczkes, 1972; 1976) or according to rates of compliance for each physiological parameter measured. In DeNour and Czaczkes (1972) original study, 12% were "excellent", 23% were "good", 19% were "fair", 30% had "some abuse", and 16% had "great abuse" of their diet.

Studies reporting compliance rates for each dietary measure and/or a combined variable compliance rate have indicated an alarming disparity in compliance rates. For example, Hartman and Becker (1978) found that only 39% of 50 patients were compliant with phosphorus, 74% with potassium levels, and 78% with IWG fluid restrictions. The percentage of compliant patients has ranged from only 7% who were classified based on their phosphorus level (Cheek, 1982) to 97% who were classified according to potassium levels (Procci, 1978). Patients considered compliant across studies based on potassium levels ranged from 33% (Cheek, 1982) to 97% (Procci, 1978). The percentage of patients considered compliant across five studies based on phosphorus levels ranges from 7% (Cheek, 1982) to 65% (Yanitski, 1983). Reviewing nine studies that measured IWG, Ferraro et al. (1986) found compliance rates ranging from 30% (Yaniski, 1983) to 78% (Hartman & Becker, 1978).

It is the general consensus that compliance in any one parameter (e.g., potassium) cannot be used reliably as the basis for overall treatment compliance (Ferraro, et al., 1986; Wolcott, et al., 1986; Binik, et al., 1989). Evaluating the relation of all compliance variables in response to a treatment which targets only one compliance variable is an empirical question currently lacking a data-based answer.

In summary, quantitative physiological measures are generally utilized in measuring compliance to diet and fluid restrictions. Studies have varied in the number of variables and the parameters by which compliance is measured, making it difficult to accurately estimate rates of noncompliance. It is obvious that noncompliance is a significant problem for these patients. To improve measurement of compliance, multiple observations of the same indicator should be used. Ferraro, et al. (1986) conclude that using multiple indicators of compliance is more desirable than single indicators when making a distinction between compliant and noncompliant patients. They suggest using a factor weighting procedure to generate an empirically sound construct. Further, variables should be maintained in their continuous form rather than collapsed into ordinal categories so as to reduce measurement error (Johnson & Creech, 1982). IWG as a measure of fluid compliance was the only measure used in all studies. If IWG is measured, residual kidney function should be controlled to more accurately reflect the amount of fluids ingested. The next section will briefly review factors believed to be associated with compliance.

Factors Relating to Compliance/Noncompliance. Various medical, demographic and psychosocial variables have been studied in dialysis patients to assess the association with treatment compliance. The major factors that have been studied in relation to compliance include: demographic variables, medical variables, knowledge, social relationships, psychological variables, and health belief factors (Binik, Devins, & Orme, 1989)

Sociodemographic variables of age, sex, race, socioeconomic status, or marital status have not predicted, or been found to be systematically related to compliance (Blackburn, 1977; Ferraro, 1986), although older patients might as a group be more compliant (Cummings, et al., 1982). However, abusers of diet and fluid restrictions are more likely to be unemployed, single males with little social support (Procci, 1978, 1981; Obrien, 1980).

Findings that social support is a factor in treatment compliance is equivocal. Hartmen and Becker (1978) found that dialysis patients with fewer family problems and more spouse assistance were more compliant. Married patients were more compliant than single patients. Cummings, et al. (1984) found little association between support given by family members and compliance. However, the extent to which patients viewed their illness as disruptive of their family was related to compliance. Further, positive staff member evaluation (Huber & Tucker, 1984) and increased staff-patient positive interactions (Tucker, et al., 1987) were associated with increased compliance in an empirical study. The lack of adequate conceptualization and operational definition of social support remains a consistent problem in investigating the relation between social support and compliance (Binik, Devins, Orme, 1989).

A commonly held belief is that a patient's level of knowledge about his or her prescribed regimen is directly proportional to compliance behaviors, but research data are equivocal (Hoover, 1989; Ferraro, et al., 1986). Brantley, et al. (1990), in using education and behavioral interventions to increase handwashing compliance in hemodialysis patients conclude that knowledge alone is a necessary, although insufficient, component.

Psychological factors implicated with treatment noncompliance include depression, increased anger and hostility, and fear of complications (DeNour & Czaczkes, 1976; Procci, 1981). It is hypothesized that abuse of dietary restrictions is a maladaptive way a patient may attempt to gain reinforcement/gratification from or show displeasure about his severely restricted environment (Procci, 1978; 1981). This hypothesis has been suggested by a recent empirical study investigating depression, stress, and fluid compliance (Everett, et al., 1990). Most of these studies have used varied psychiatric interviews to identify and assess psychopathology, and have been flawed methodologically (Binik, et al., 1989).

Investigators have examined several intrapersonal characteristics of beliefs and attitudes as they relate to adherence. Variables that have received considerable attention recently include internal-external locus of control (Schneider, et al., 1991; Blackburn, 1977, Poll & DeNour, 1980; Wenerowicz, Riskind, & Jenkins, 1978) and health beliefs and perceptions (Cummings, et al., 1982; Bollin & Hart, 1982). Internal locus of control refers to an individual's belief that he/she can exert an influence on a health outcome by his/her actions. Individuals with an external health locus of control are presumed to have expectancies that luck, fate, or powerful others control their health outcome. Some studies have supported the hypothesis that individuals with an internal locus of health control are more compliant to treatment recommendations than externals (Poll & DeNour, 1980; Wenerowicz, et al, 1978; Bollin & Hart, 1982), while one study found no relationship (Blackburn, 1977). In each of these studies the majority of the patients were classified as "externals" compared to normals. In the Schneider, et al. (1991) study variables of emotional distress (i.e., depressed mood) and cognitive variables (locus of control and perceptions of adherence) were evaluated. Results indicated that mediators of compliance were cognitive variables of perceived control and perceived success and not emotional variables or locus of control.

Related to these studies, Christensen et al. (1990) measured the preference for active behavioral involvement in home and in-center hemodialysis patients and compared these ratings to compliance data and depression ratings. These investigators found that in-center patients rated as high in behavioral involvement were less compliant and more distressed compared to home dialysis patients high in behavioral control. Conversely, the home hemodialysis patients rated low in behavioral involvement were less compliant and more distressed than the low behavioral involvement in-center patients.

Investigations of health belief variables attempt to measure patients' beliefs and their choices among various health alternatives. The emphasis is on what the individual believes, rather than on what is held scientifically correct (Cummings, et al., 1984). In separate studies, patients indicated that they placed high value on health, were motivated to be healthy, and believed that following the treatment regimen could prevent serious consequences; but in both studies these health beliefs were not significantly related to compliance parameters (Cummings, et al., 1982; Bollin & Hart, 1982). These authors also investigated relevant demographic variables, social support, health beliefs, and psychological variables (e.g., depression) and found none to be powerful predictors of compliance. They concluded that patients were noncompliant primarily as a result of situational factors (e.g., cravings for non-diet foods; difficulty preparing meals; being away from home).

In summary, several factors have been demonstrated in isolated studies to be potential factors contributing to compliance to treatment regimens, but no consistent or powerful findings have emerged. Nonetheless, future studies should measure relevant demographic/medical variables, psychological variables (e.g., depression), social support, and health beliefs to continue to investigate their role in treatment adherence.

Compliance Strategies in Chronic Disease

Researchers have utilized numerous approaches to improve adherence to medical regimens. The majority of compliance studies have been instituted to solve specific problems, with little emphasis on theory (Epstein & Cluss, 1982). A review of the pervasive theoretical models will follow.

The early study of patient compliance followed the medical model. **Biomedical models** of compliance contend that disease is resultant of biochemical malfunctions caused by invasions of foreign agents (e.g., viruses, bacteria), genetics, or the natural breakdown of the body's parts or processes. These changes generate symptoms and functional deficits that are treated through the advice and skills of professionals. In this framework, patients are viewed as the recipient and performer of regimens that are expected to be obeyed (Engel, 1977). Unfortunately in the case of chronic disease symptoms will persist and the expectation by health care professionals of positive and rapid results is inappropriate. In this model, noncompliance is viewed as the direct result of personality aberrations such as laziness, ignorance, or willful neglect (Leventhal, et al., 1984). This model encourages the labeling of "noncompliant" and searches for characteristics that differentiate the noncompliant person from the compliant person. Studies usually focus on dispositional characteristics of the patient rather than on situational factors and cognitive processes involved in the interpretation of environmental stimuli (Kirscht & Rosenstock, 1979). This viewpoint ignores important concepts of preventive behavioral change and psychological coping, and to date no personality profile for noncompliance has been identified (Burish & Bradley, 1983).

The emergence of the field of behavioral medicine has introduced strategies and treatments based on learning theory to the domain of chronic disease (Blanchard, 1987). The view of the noncompliant patient as a person with characterological abnormality has been supplanted in part by behavioral concepts, where investigators avoid blaming individuals for noncompliance and focus on the environmental conditions which promote or reduce adherence to treatment recommendations (Stunkard, 1979). Many recent intervention studies have been guided with behavioral components and theoretical orientation. Leventhal and Cameron (1987) divided these strategies into the following: (1) a communications approach; (2) rational belief theory; (3) self-regulative systems theory; and (4) operant behavior and social learning theories. These models emphasize, to different degrees, the interaction between person and environment.

The **communications approach** is concerned primarily with educating and informing patients about their disease. Although relatively non-theoretical, this approach was the most frequently utilized in a review of compliance studies (Haynes, et al. 1979). This approach accounted for 36% of all studies. Those persons who understand and have adequate knowledge about their medical condition are thought to be more compliant. Therefore this approach advocates patient education as the answer to improving adherence. The educational message should be well specified, organized, and delivered in a manner that will allow the patient to attend to it completely (Ley, 1977). The finding that knowledge is a necessary, although not a sufficient, condition for compliance is the general consensus that is supported empirically (Brantley, et al., 1990; Haynes, 1982).

Cognitive-behavioral models of adherence to treatment regimens posit that behavior is reciprocally determined by an individual's cognitive structures and processes, interpersonal behaviors, and their resulting consequences from the environment (Bandura, 1977; Meichenbaum & Turk, 1982). Behavior change can be accomplished by cognitive changes that could begin at the point of cognitive structures (i.e., changing beliefs) or cognitive processes (e.g., changing automatic thoughts, images, and coping skills). An example of a cognitive behavioral model that has received considerable attention is the Health Beliefs Model (HBM) (Maiman & Becker, 1974). The HBM is a **rational belief theory** that contends human behavior is determined by an objective, logical thought process. It posits that when a person is given appropriate information on health risks and the benefits or consequences of various behaviors, an individual will modify his/her actions to preserve health. Noncompliance, then, results from insufficient knowledge of the benefits and/or hazards of engaging or not engaging in prescribed behaviors. The theory suggests choices are made on the basis of a cost-benefit computation and that modification of beliefs may be necessary to consider when trying to increase long-term adherence.

In general, the body of research using this paradigm provides only modest support for associations between these attitudes and compliance (Cummings, et al., 1981;1982; Janz & Becker, 1984). This theory can only predict as much of the variance in compliance as is due to attitudes and beliefs. It does not consider coping skills and ignores automatic actions and thoughts that make up much of daily activity (Leventhal & Cameron, 1987). A major problem for the HBM has been the lack of standardized measures for its central constructs (Binik, et al., 1989).

Models of adherence that emphasize **self-regulative** behavior are also considered models with cognitive processes as central operatives (Leventhal, et al., 1984). Several models of self-regulatory behavior have been advanced to explain the mechanisms responsible for self-control. Self-control is an attribution most often applied to behavior for which immediate external consequences are not apparent, to behavior that does not have a high rate of occurrence, and to behavior that is socially desirable and that involves some degree of self-sacrifice (Pinkerton, Hughes, & Wenrich, 1982). These models have three basic tenets: (1) Self-regulatory behaviors are learned through life experiences; (2) The ability of a person to self-regulate can become impaired as a result of psychological stress, physical injury, or trauma; (3) Training with cognitive-behavioral techniques can teach new or improve existing skills. As self-control is enhanced, the individual can cope with or overcome competing environmental events responsible for maintaining maladaptive behavior patterns, and self-esteem will be increased (Keefe & Blumenthal, 1982). This suggests that different people will construct different mental representations (e.g. appraisal) of the same illness threat and may see different options (coping rules) as appropriate for containment of that threat.

Empirical support for self-control models are equivocal and generally lacking in significant power. In one recent study, it was demonstrated that smokers who relapse post-treatment had significantly reduced risk perception comparative to when they initiated treatment. Similarly those who had not relapsed lowered their belief ratings of being susceptible to smoking-related diseases (Gibbons, McGovern, & Lando, 1991). Conversely, in a study of weight loss and glycemic control, training in self-regulation as a part of a standard behavioral weight control program in diabetics did not improve weight loss or glycemic control significantly compared to the treatment program with self-monitoring only (Wing, et al., 1988). In fact, trends in the data suggested that the self-monitoring condition maintained greater changes post-treatment and at one year follow-up. These authors suggested the self-regulation component may in some cases actually detract from a weight control program. Adding self-regulation may overload the subjects who already are dealing with a complicated treatment regimen.

This model suffers from similar problems as the HBM. Empirical support for this model is lacking primarily due to the absence of operations to assess specific constructs such as coping plans or appraisal. There is also a lack of standardized instruments for measurement. Further, the interactive nature of this model complicates conceptualization of the variables mentioned and forces the investigator to make decisions concerning when a given variable is a dependent or independent measure. Although not easily demonstrated empirically to date, this model correctly suggests that appraisal, coping skills, and attitudes may contribute to patient differences observed in long-term adherence, and changes that can occur over time or during active treatment should be monitored.

Involving the patient in his/her own treatment is the focus of the self-regulation model. Failure of the patient to self-regulate, which could be due to failure of the health professional to adequately train or motivate patients, becomes a primary reason for decreased adherence in chronic treatment regimens. Although knowledge and beliefs will provide some motivation, they are typically not sufficient to sustain behavior. Patients need to be reinforced to carry out self-care activities (Turk, Salovey, & Litt, 1986). Developing strategies that allow patients to self-regulate effectively is the topic of the next section.

Operant and social learning behavioral models are among the most frequently used in health care. These models rely on procedures that attempt to alter health risk behaviors perceived to result from automatically elicited behaviors in response to powerful internal or external cues (Leventhal, Zimmerman & Gutman, 1984). Based upon learning theories of Pavlov, Skinner, and Tolman these models attend to the stimuli or cues that elicit behavior, the rewards that reinforce the behavior, the gradual shaping or patterning of the behavior, and its automation after sufficient repetition. Bandura (1977) added concepts of modeling and vicarious learning from social learning theories that contribute cognitive components to behavioral models.

Training in structuring one's environment and in the performance of specific action sequences comprise the core of the skills training programs that characterize contemporary behavioral theory (Dunbar, Marshall, & Hovell, 1979; Kasl, 1975). Epstein and Cluss (1982) reviewed behavioral techniques used in 15 studies to increase compliance to long-term regimens. A few of the populations studied included asthmatics, diabetics, epileptics, hypertensives, and patients with glaucoma. Although these studies varied in the types of behavioral manipulations used, the majority demonstrated improved compliance during the intervention. Unfortunately several studies did not collect follow-up data but in and those that did, compliance improvements returned to baseline levels when the intervention was removed. They concluded that reinforcement or feedback approaches were more effective than self-monitoring in promoting compliance.

Operant and social learning techniques are used in intervention programs for weight reduction (Stunkard, 1979), smoking (Leventhal & Cleary, 1980), and alcoholism (Sobell & Sobell, 1973) to name a few. These interventions have produced high (60-90%) success rates in many targeted populations, but a consistent problem has been maintenance of compliance upon removal of the intervention. Hunt and his associates (Hunt & Bespalec, 1974; Hunt & Matarazzo, 1971) plotted therapeutic outcomes for three target behaviors: withdrawal from smoking, heroin, and alcohol. For all three behaviors, 60% of those "successfully" treated had relapsed three months after therapy, increasing to 70% at six months, and 75% at 12 months. Clearly maintenance of compliance behaviors for many patients is problematic.

Reinforcement paradigms are most frequently used in behavioral models and several issues remain unresolved regarding the operation of reinforcers in these procedures. There appear to be differences in population responses to either negative or positive reinforcement. For example, Mahoney & Mahoney (1976) provide evidence that positive reinforcement serves as the major promoter of compliance to weight loss programs, as self-reward appears more effective in reducing weight than either self-punishment or negative reinforcement. In separate studies of positively reinforcing symptom reduction in diabetic children and hypertensive adults, compliance to regimens was improved (Epstein, et al., 1981; Haynes, et al., 1976). Reinforcing medication intake was associated with longer relapse rates in a study of alcoholics (Bigelow, et al., 1976). Alternatively, smoking cessation seems best accomplished by aversive therapies (Lando, 1981), particularly when combined with effective counseling procedures that prepare the smoker to cope with internal and external cues which stimulate the urge to smoke (Marlatt & Gordon, 1985). Similarly, aversion therapies have also been effective in treating alcoholism. This finding suggests interventions to improve compliance may need to be tailored to a particular population, as some will respond to positive reinforcement, some to aversive therapies, and others to a combination of these procedures.

Behavioral contracting is a common method used to increase compliance. Patients agree to meet specific criteria in order to receive rewards. One of the main advantages of contracting procedures is that they force the patient out of the "sick role" and require them to assume and specify responsibility for their own behavior (Davidson, 1982). However, high rates of compliance will generally continue only as long as the contracted behaviors are reinforced. Performance decrements that accompany reinforcement withdrawal are typically explained in terms of motivational changes.

Following the logic that compliance will be maintained only as long as it is reinforced, researchers have turned to methods of utilizing self-reinforcement as a means of providing continued reinforcement. Researchers have found that most subjects fail to use self-reinforcement to control their behavior as they tend to reward themselves excessively when they haven't complied and consistently fail to punish themselves for noncompliance. Also, most people have extreme difficulty in generating self-rewards and punishments (Kanfer, 1979). The motivation for chronic illness patients to self-punish is extremely low as they will seldom have sufficient immediate negative symptoms or side effects of noncompliant behavior. Additionally, this will reinforce the noncompliant behavior, making it more likely to happen in the future.

The finding that many chronically ill noncompliant patients are depressed or with reduced self-esteem indicates that the extent that self-reinforcement increases self-efficacy will probably determine if patients will engage in treatment-compliant behaviors.

In a controlled empirical study of breast self-examination in 153 women, the effects of external reinforcers (token for a lottery ticket) compared to self-reinforcers (a list of ideas to "do something nice for yourself") on treatment compliance were compared for one year (Grady, et al., 1988). These researchers found external reward to increase the treatment compliant behaviors significantly more than either the control group or the self-reward group. The self-reward group did not differ significantly from the control group. With removal of the external reward compliant behavior dropped sharply, but remained higher than the self-reward group.

While behavioral programs have improved compliance almost universally in health care, almost all have problems in attaining long-term or maintenance changes in behavior. Relapse or return towards baseline following behavioral programs seem to occur because reinforcers from the individual's environment are removed while the cues for the non-compliant behaviors persist (Leventhal & Cameron, 1987). When strategies for coping with temptation cues in the environment have been included compliance has been maintained for longer time periods in some populations (Cooke & Meyers, 1980) but not in others (Glasgow & Lichtenstein, 1987). This has convinced some researchers that chronic diseases (e.g., hypertension, diabetes, obesity) should have continuous treatment for long-term adherence (Brownell & Jeffrey, 1987).

In this paradigm, key aspects of compliance should be monitored and placed under contingencies on an ongoing basis. This viewpoint assumes that long-term adherence is not a learning deficit and therefore not entirely correctable by skills-enhancing strategies. The previously reviewed educational, communications, and cognitive-behavioral approaches are clearly insufficient in producing lasting compliance without motivation or incentives. It should not be assumed that long-term adherence can be continued without continual reinforcement.

In summary, several models and intervention strategies have been reviewed that attempt to conceptualize compliance to medical treatment. Operant and social learning theory models with behavioral and cognitive-behavioral interventions have empirically demonstrated significant improvement in compliance. Interventions utilizing both positive and aversive components have been demonstrated effective. The most obvious weakness in all of the interventions has been the tendency for reduced long-term compliant behavior when contingencies have been removed. Cognitive-behavioral strategies to improve self-regulation are difficult to operationalize and have not always improved long-term adherence.

Researchers appear now to be questioning the efficacy of removing contingencies for adherence in conditions where medical treatment is ongoing. The next section will describe interventions used in compliance studies involving hemodialysis patients.

Compliance Strategies in Hemodialysis Patients

Intervention strategies to increase regimen adherence in hemodialysis patients have followed the theoretical models previously reviewed. In general, behavioral and/or cognitive-behavioral modification techniques have been effective in eliciting improved adherence (Wolcott, et al., 1986). Behavioral treatments have included patient education, contracting, contingent reinforcement, and shaping to improve adherence to various aspects of the dialysis treatment regimen. Further, some studies have attempted to increase self-regulation by changing health beliefs and attitudes (Cummings, et al., 1981). Dialysis patients appear similar to the majority of chronic illness populations in that interventions have not had lasting long-term effects. Similar to other chronically ill populations, dialysis patients return to baseline levels of adherence when contingencies or treatment interventions are terminated (Finn & Alcorn, 1986).

As with intervention studies in other chronic illness populations, dialysis researchers are interested in investigating self-regulative behaviors that would enhance long-term compliance (Kirschenbaum, et al., 1987). A rather limited number of published intervention studies exist in this population, and various methodological flaws have made explanation of treatment effects difficult to reliably interpret (Binik, et al., 1989). Some of the problems associated with measuring compliance parameters of specific variables have been reviewed by Ferraro, et al. (1986), Wolcott, et al. (1986), and in a previous section of this manuscript. Despite these and other design flaws, a review of studies concerned with treatment adherence and/or changing health attitudes in dialysis patients will follow. Specific studies will be emphasized with an attempt to integrate relevant findings into current compliance models and theories.

Although behavioral techniques are frequently effective in improving adherence, the communications or educational approach has been the most frequently tried way to promote compliance (Mathews & Hingson, 1977). The primary target behaviors for interventions have been fluid or diet restrictions, although other behaviors have been studied. Providing the hemodialysis patient with a clear description of the condition, how it is treated, and the implications of treatment and noncompliance are generally included. Unfortunately these studies have typically lacked control groups or combined approaches, making the effects of knowledge difficult to interpret. One recent study used different behavioral treatment groups, including an education only group as well as a control group, to improve vascular access handwashing compliance in dialysis patients (Brantley, et al., 1990). The education only intervention group was found less adherent than the behavioral treatment only group or a combined behavioral/education group. These authors considered knowledge a necessary, although insufficient, component for improving compliance in hemodialysis patients.

In an attempt to understand the role of health beliefs and attitudes in dialysis patients, Cummings et al. (1981) studied changes in adherence in one of the largest and most sophisticated studies to date. They studied 116 hemodialysis patients using a pretest-posttest control group design. Serum potassium and IWG, as well as health beliefs, were measured at baseline, at the end of a six-week intervention, and 12 weeks post intervention. Health beliefs were measured by having patients rate on a seven-point Likert scale beliefs pertaining to particular health dimensions (e.g., perceived susceptibility to sequelae of noncompliance, perceived severity of sequelae associated with noncompliance, beliefs about benefits of adherence to treatment requests, and perceived barriers to following treatment requests). Baseline measures of potassium and IWG were based on six observations, three taken before and three taken after an initial patient interview. There were four treatment conditions: (1) behavioral contract between patient and dialysis nurse, (2) behavioral contract with a member of the patient's social group, (3) a weekly phone call from a dialysis nurse designed to alter health beliefs, and (4) a control group.

The contracted groups had contingencies to keep IWG less than 3 kg and potassium 5.5 mEq or below. Rewards for compliance were state lottery tickets as well as feedback from nursing staff each time the patient dialyzed. The health beliefs intervention group received calls from nursing staff who problem-solved with patients to help identify difficulties the patients were having with various aspects of the regimen, gave information concerning the benefits of treatment adherence, and offered solutions to help maintain proper adherence. Further, these calls were designed for staff to give verbal support and encouragement to treatment adherence. The control group condition consisted of an absence of special intervention considerations.

Results indicated that the three treatment interventions achieved substantial reductions in patient's serum potassium and IWG and the changes were significantly different ($p < .05$) than the control group at the end of the intervention. It should be mentioned that improvement in adherence also occurred in the control group. There were not significant differences between these three treatment groups at the end of the intervention, and at 12 weeks post-intervention none of the treatment groups were significantly different from the control group.

The authors found that health beliefs were generally not predictive of compliance as correlation analysis of baseline compliance measures (e.g., IWG and potassium), and health beliefs were significant only for perceived barriers to treatment adherence ($p < .05$). Statistical analysis of the HBM intervention indicated that health beliefs were not significantly altered through their intervention. Interestingly, behavioral interventions showed improved health beliefs ratings at both post-treatment and follow-up measurement that were similar in magnitude to the improvements seen in the HBM intervention group. This suggests that during contingency reinforcement and when contingencies are removed, health beliefs and attitudes will not be changed in a negative fashion.

The comparative effectiveness of each treatment is unclear as the control group also improved. This study highlights the reactive effects that occur for patients involved in any study, and the need for treatment studies to have a control group. Noncontingent attention from the nursing staff may be sufficient to produce compliance. One other problem with this study was the targeting of several compliance parameters in each of the treatment groups therefore reducing the knowledge about which treatment affects a specific parameter. Future studies should employ specific treatment for specific target behaviors.

No other group treatment study has specifically measured health beliefs and attitudes in relation to adherence interventions. However, Hegel, et al. (1989) studied three patients who were considered fluid abusers. Using single case design these three patients, who had passed a rudimentary knowledge questionnaire, were treated in an A-B-A-C-BC design to determine the effectiveness of behavioral strategies or strategies to change health beliefs in the single targeted variable of IWG. In the first study treatment B was reinforcement for attaining criterion weight gain. The reinforcer was being able to watch a video while dialyzing. Treatment C was a counseling intervention based on the HBM for adherence (Becker and Maiman, 1975). In this study IWG was significantly reduced by the behavioral reinforcement intervention only. The treatment design was reversed (B = HBM intervention, C = Behavioral intervention) and similar results were obtained. These researchers concluded that the behavioral methods were superior in terms of creating stable levels of optimal adherence and that adding health belief interventions does not improve compliance. No follow-up data were reported. Similar to the Cummings, et al. (1981) study, these authors found that only the health belief of perceived barriers to adherence to change in relation to adherence. Interestingly, this change followed the behavior change and not vice versa.

In the two studies reviewed, it appears as if health belief modification may not be important in changing adherence in dialysis patients. However, because the interventions were relatively short in duration health beliefs may not have had sufficient time in a treatment condition to change and be effective in long-term adherence changes. The Cummings, et al. (1981) intervention lasted only six weeks and the Hegel, et al. (1989) study with differing treatments lasted a total of only 10 weeks for only three subjects. It is possible that health beliefs may require a lengthy time under treatment conditions to change. Cummings et al. (1981) suggest that interventions need to be continuous to be effective. Several studies have lengthened behavioral treatment interventions to improve adherence in dialysis patients.

In one such study, Tucker, et al. (1990) used three behavioral interventions with multiple components to improve fluid compliance in 103 hemodialysis patients with greater than 2 lbs. per day weight gain. The four groups consisted of: (1) Fluid intake self-monitoring, staff praise and monetary incentives for fluid self-monitoring, and staff praise for fluid adherence (fluid weight reduction); (2) The first intervention plus behavioral control of fluid via graphing the relation between reported fluid intake and actual fluid weight gain; (3) The second intervention plus structured support (praise of and assistance with adherence efforts) from a family member; and (4) a control group.

Few details are presented concerning methods and data analysis in their presentation. These authors did not measure health beliefs or attitudes and focused only on differences between treatment groups. It was found that Groups 2 and 3 did not differ significantly, but showed significantly better adherence than Groups 1 and 4 after 18 weeks of intervention as tested by a repeated measures ANCOVA. No follow-up data were reported. Utilizing family members to successfully increase compliance implies that family support is a relevant factor in achieving compliance. This study is able to demonstrate improvements in compliance in the targeted variable of IWG with longer treatment interventions, but it is difficult to assess which components are responsible for the changes observed. Further, the study could have been strengthened by reporting when treatment effects occurred and if they strengthened or weakened throughout the intervention.

In a smaller investigation, Skoutakis, et al. (1978) studied 24 hemodialysis patients during eight months of treatment. This represents the longest published treatment intervention to date in the dialysis literature. Baseline measures of patient knowledge, compliance with drug regimen, and biochemical and therapeutic responses (which included potassium, BUN, phosphorus, and IWG) were measured. Unfortunately these authors combined biochemical indices and IWG into four broad categories of compliance (e.g., from "excellent" IWG never above 500g; predialysis serum potassium levels never above 6 mEq/L and steady predialysis BUN levels) to ("great abuse" IWG always greater than 2kg; predialysis potassium greater than 7 mEq/L), so the effects of their treatments on specific compliance variables is not accessible.

The treatment program lasted eight months and consisted of a combination of education, patient consultation from pharmacists during dialysis sessions, and written reminders to take medications. After four months one-half of the group was terminated from treatment. A significant increase in compliance was reported, based on t-tests, for each group immediately following treatment. Compliance was maintained and more patients became compliant in the group that continued in the treatment, but not for the group that was terminated from the intervention. No follow-up data were reported for the group that was treated for eight months. Although these authors did not measure health beliefs changes, knowledge scores continued to improve with the group treated for eight months. The important finding of this study is that continued improvement in adherence for dialysis patients was maintained for eight consecutive months of a behavioral intervention. As has been the case with the studies reviewed previously, the determination of the component responsible for treatment effects is not possible, and this study lacked a control group for comparison.

One of the few compliance studies that did target a specific behavior and effectively compared varied treatment conditions is the previously mentioned Brantley, et al. (1990) study. In this study designed to increase rates of proper vascular access cleansing, 56 dialysis patients were randomly placed into one of four experimental groups: educational/behavioral, behavioral, educational, and attention control. The education treatment used a brief videotaped patient education program. The behavioral intervention consisted of visual prompts for vascular access cleansing and contingent reinforcement. A raffle ticket was given for each session of appropriate washing in a two-week treatment program. The attention control group was given raffle tickets and allowed to watch a general hygiene video.

Results showed that all experimental groups were not different at pretreatment levels of knowledge, but patients in the active treatment conditions gave significantly more correct answers on a knowledge questionnaire post-treatment than did the control group. The education/behavioral and behavioral groups completed significantly more washing techniques at one month follow-up than did the education and control group patients. One year follow-up showed that sample size was considerably reduced from patient death and attrition, and there was no suggestion that maintenance of cleansing behaviors were maintained. Based upon their results these authors report that knowledge was a necessary, but not sufficient element to maintain vascular cleansing compliance behaviors. It was suggested that incentives or contingent reinforcements are the necessary components for maintenance adherence and should be routine.

In summary, it is apparent that several behavioral interventions improve adherence to the dialysis regimen. However, most dialysis studies have been limited by sample size (only two studies with sample size of over 60 subjects) and other methodological problems (i.e., lack of follow-up data, lack of appropriate control groups). The variable most often intervened upon has been IWG. To date it is difficult to determine which treatment is superior or responsible for improved adherence. The studies mentioned have either combined many components or lacked a control group, although a behavioral contract with contingent rewards has been a particularly successful method. It is possible that the reactive effects of the research process (patient interview, increased staff-patient interactions, etc.) may be sufficient to generate treatment effects (Finn & Alcorn, 1986).

Behavioral interventions such as contracting for a contingent reward have shown promise for increasing patient compliant behaviors in hemodialysis patients as well as other chronically ill populations. These methods are thought to increase patient motivation by directing it towards designated goals by systematic social interactions and attainment of specific rewards based upon performance. These treatment interventions should increase self-regulative behavior and improve beliefs and attitudes toward illness thereby increasing long-term adherence. Altered health beliefs and attitudes that improve self-regulation have not been extensively studied in the dialysis literature, and initial studies are equivocal in findings (Cummings, et al., 1981; Hegel, et al., 1989). Interestingly, behavioral treatments without self-regulation or health beliefs change components have led to improved attitudes and health beliefs when measured (Cummings, et al., 1981). No reported instances of deleterious effects on health belief or attitudes due to contingency management of compliance parameters have been reported.

While treatment interventions to improve dietary compliance are in place, dialysis patients tend to have improved adherence rates. Unfortunately, a consistent return to baseline levels of adherence is observed when the intervention is terminated. Most of the treatment interventions in the dialysis population have been relatively short in duration, e.g. as only one study intervened for more than five months (Skoutakis, et al., 1978). Treatment effects were maintained and improved over time in this study, although there was no follow-up data to determine if behaviors were maintained. Interventions studies that have measured health belief changes and attitudes towards self-regulation have only lasted six and nine weeks respectively. It is quite possible that longer treatment interventions will lead to health beliefs and attitude changes that might effect lasting changes in adherence. If health beliefs or attitudes towards illness change as adherence rates improve or remain at a high level during a lengthy behavioral intervention, support would be given to the idea that long-term adherence is dependent upon continual contingency management. Change in health beliefs and attitudes in response to long-term behavioral treatment that could lead to maintenance compliance behaviors needs closer examination.

PURPOSE

Patients are generally compliant with dialyzing, but estimates hold that nearly 50% are notoriously noncompliant with the dietary and fluid restrictions despite the adverse health consequences (Ferraro, et al., 1986). For this reason interventions to improve patient adherence to aspects of their treatment regimen are of considerable importance. ESRD patients maintained on hemodialysis are an excellent representative of chronic illness populations because critical behaviors must be managed and altered for patients to feel well. The patient is responsible for attending treatments and following restrictive dietary, activity, and medication regimens to feel well. Most health care professionals believe that compliance with the dialysis regimen will prevent or at least abate short- and long-term medical complications (Acchiardo, Moore, & Cocherell, 1984).

This project was designed to investigate factors related to adherence to fluid restrictions in hemodialysis patients, to compare two treatments to improve fluid restriction adherence rates, and to improve upon some of the methodological limitations of previous intervention studies. Fluid adherence was chosen as the single targeted behavior for change because fluid overload can lead to immediate, long-term, and even fatal health consequences. Further, this variable is reliably and easily measured. It has been used in the vast majority of previous hemodialysis compliance studies.

A general goal was to improve upon the methods of previous adherence and intervention studies. An attempt to more completely measure variables that serve as mechanisms for behavior change towards adherence in hemodialysis patients was made. A large sample was recruited, a randomly assigned control group was included, and follow-up data were collected to more completely and reliably study adherence to fluid regimen. This design allowed for both retrospective and prospective evaluation of compliance and noncompliance behaviors in hemodialysis patients.

Predictors Study.

In a retrospective study, psychological, medical, and demographic variables were collected at baseline and compared to pre-intervention intersession fluid weight gains. The following question was addressed by this retrospective predictors study:

Question 1: At baseline, were there specific subject variables that predicted pre-intervention noncompliance to fluid restrictions?

Previous literature reviews (e.g., Binik, et al., 1989) suggested no variables have consistently been associated with nonadherence to fluid restrictions. Because of their use in previous studies, medical and demographic variables of sex, age, length of time on dialysis, education, and concurrent diagnoses were included for measurement. Psychosocial measures included social support, depressed mood, health locus of control, and fluid regimen knowledge.

Hypothesis 1: It was hypothesized that some of these variables would predict a baseline level of nonadherence. No hypothesis was made as to which variables would be predictive of nonadherence. Intervention Study

In a prospective intervention study, patients were randomly assigned to treatment groups to evaluate the effectiveness of a simple, long-term behavioral intervention to improve rates of adherence to fluid restrictions. For this study, a control group was established to compare treatment effects. The treatment intervention consisted of feedback and contingent reward of adherence to a specified IWG. The attention control group received feedback and noncontingent reward. It was hoped that comparing a contingently rewarded group to a group receiving noncontingent reward would more clearly evaluate the active component of reinforcement treatment by removing the confounds of multi-component interventions used in previous intervention studies.

Additionally, it was believed that a simple treatment could potentially be implemented by dialysis staff and therefore represented the most clinically useful and cost effective intervention to evaluate. Although its efficacy had not been empirically tested, a cost effective intervention that would offer treatment to large patient groups without intensive labor for dialysis staff was reasoned to be a useful addition to the treatment protocol of hemodialysis patients.

Relevant subject variables that have been implicated as factors relating to adherence, such as health locus of control, regimen knowledge, social support, depressed mood, and relevant demographic/medical variables were studied. Changes in variables of locus of control and depressed mood were selectively studied to test hypotheses that particular beliefs and attitudes towards health are necessary for patient adherence to medical requests. During the course of this study the following questions were addressed:

Question 1: Did behavioral contracting improve fluid compliance in hemodialysis patients after one month? Were gains maintained after six months of treatment?

Hypothesis 1: Based upon previous studies, it was hypothesized that patients receiving feedback and contingent reinforcement for fluid adherence would improve their adherence compared to controls receiving feedback and noncontingent reinforcement. Not only would groups differ at one month of treatment, but compliance rates would remain significantly different during six months of treatment.

Question 2: Did the reactive effect of being in a research study and receiving non-contingent reward (control group) improve fluid adherence in hemodialysis patients?

Hypothesis 2: It was hypothesized that although adherence in the feedback and noncontingent reward group may improve slightly; However, changes from baseline rates would not be as great as the contingent reinforcement group, and adherence improvements would decline as the study progressed.

Question 3: Assuming the contingency contract significantly improved fluid adherence and treatment effects were maintained for six months, were the effects maintained at a one month post-treatment follow up?

Hypothesis 3: It was hypothesized that six months of treatment is sufficient for behavior change to maintain adherence gains at one month post-treatment.

Question 4: What were the effects of a six-month behavioral treatment intervention on health beliefs and attitudes in dialysis patients?

Hypothesis 4: It was hypothesized that six months of treatment would allow for health beliefs and attitudes to change such that patients would show greater degrees of self-regulation associated with increases in internal locus of control scores and decreases in chance external locus of control scores.

Question 5: What were the effects of a six-month behavioral treatment intervention on depressed mood in dialysis patients?

Hypothesis 5: It was hypothesized that patients would show significantly less depressed mood ratings as they became involved in the intervention and adherent to fluid requirements.

METHODS

Subjects. One hundred forty-one hemodialysis patients of Bio Medical Applications of Baton Rouge, LA from three outpatient units were recruited for participation. Since residual kidney function may effect intersession weight gain, those patients with self-reported residual kidney functioning sufficient to produce at least 250 ml per day and/or less than three months hemodialysis treatment were excluded from the study. Additionally, patients with severe physical impairment, mental retardation, or those who could not comprehend instruction were excluded. Seventeen patients had not been on treatment dialysis for three months or more and were excluded form the study. Two of these 17 reported urinary output greater than 250ml. An additional four patients indicated their residual kidney function sufficient to produce 250ml/day of urine and were therefore excluded. Approximately 20 patients were excluded due to severe physical or cognitive impairment, and approximately 25 patients refused participation in the study.

Patients with a high school education or who demonstrated acceptable reading abilities were allowed to read and complete questionnaires themselves. For those with physical limitations (poor eyesight, vascular access on dominant arm) or unable to accurately complete the questionnaires, research assistants assisted in collecting data by reading to participants or writing out answers.

This research sample consisted of 69 females and 72 males, with mean age of 51.1 years. The average length of time on dialysis was 39.5 months. The majority of the sample was currently unemployed (90%), black (80%), and had reported income of less than $10,000 per year. Education level varied, but 44% of the sample had not received a high school diploma. Demographic/medical characteristics of the sample are presented in Table 1 (See Appendix G).

Initial random assignment led to 71 participants being placed in the contract contingent reinforcement group (CCG) and 69 in the noncontingent reinforcement attention control group (ACG). During the course of the seven month intervention, many participants were lost from the study. Only 53 CCG and 43 ACG patients completed the IWG intervention study. Patients were lost from the study for many reasons including transferring/moving, death, receiving kidney transplants, hospitalizations, or dropping out of the treatment. The major reason subjects were lost from the intervention study was refusal to participate after baseline measures were collected, with almost twice as many of ACG group compared to the CCG group refusing to participate. Three participants from each group died, two patients received kidney transplants, and nine participants were hospitalized. Table 2 lists the number of subjects, and reasons for attrition.

Measures.

Intersession Weight Gain (IWG). IWG served as the measure of fluid adherence. It was calculated by subtracting the subject's weight post-dialysis treatment of the most recent completed session (e.g., Time 1: Monday after treatment) from predialysis treatment of current treatment session (e.g., Time 2: Wednesday prior to treatment). The sum of each IWG for a week (three treatment sessions) served as the measure of compliance to fluid restrictions in the intervention study. In the retrospective study the three-month average weekly IWG served as the measure of fluid compliance.

Medical/Demographic Variable Questionnaire. A questionnaire to assess relevant medical and demographic variables was completed. Inclusive variables were age, sex, race, concurrent diagnoses, length of time on dialysis, education, employment status, annual income of household, marital status, and number of persons in household. This questionnaire is presented in Appendix B and has been used in previous hemodialysis studies (Everett, et al., 1989; Brantley, et al., 1990).

Fluid Knowledge Questionnaire. This is a 20-item true-false questionnaire designed to measure knowledge of fluid requirements of dialysis patients. The questionnaire was developed for this study and questions came from a dialysis handbook that was given to each patient. The staff dietician reviewed the items and indicated each item was representative of relevant fluid information. The questionnaire is presented in Appendix C.

Social Support Questionnaire (SSQ-short form). A recent review of social support instruments (Heitzmann & Kaplan, 1988) suggests the SSQ (Sarason, et al., 1983) provides valid and comprehensive assessment of the construct of social support. The short form of the SSQ (Sarason, Shearin, & Pierce, 1987) is a measure of the quantity and quality of an individual's perceived social support. It describes six situations and asks subjects to list the people whom they can count on in each particular situation. For each question the subject gives a satisfaction rating of the support given in each situation on a scale from 1 (very satisfied) to 6 (very dissatisfied). These scores are summed to yield an overall satisfaction rating score. The short version yields internal reliability coefficients of .90 to .93 for the frequency and satisfaction rating scales. The SSQS is presented in Appendix D and has been used previously in a study with hemodialysis patients (Hitchcock, et al., 1990).

Center for Epidemiological Studies Depression Scale (CES-D). The CES-D (Radloff, 1977) is a 20-item self-report inventory that is widely used as an index of the number and frequency of depressive symptoms experienced in a week. After reading a statement, subjects rate on a scale from 0 (rarely or none of the time) to 3 (most or all of the time) how often they felt in accordance with that statement. The CES-D has good internal consistency with alphas of roughly .85 for the general population and .90 for psychiatric populations. Split-half and Spearman-Brown reliability coefficients range from .77 to .92. It can also be viewed as a measure of non-specific psychological distress because it seems also to measure anxiety and self-esteem (Weissman, Sholomskas, Pottenger, Prusoff, & Locke, 1977; Orme, Reis, & Herz, 1986). Comparison of CES-D scores across different populations were conducted in a large sample with acute depressives scoring on average 38.10 (SD=9.01), recovered depressives scoring 14.85 (SD=10.06), alcoholics scoring 22.97 (SD=13.58), and community adults scoring 9.10 (SD=8.60). The CES-D is presented in Appendix E.

Multidimensional Health Locus of Control (MHLC). The MHLC (Wallston, Wallston, & DeVellis, 1978) is an 18-item questionnaire designed to determine the way people view health-related issues. Subjects rate items from 1 (strongly disagree) to 6 (strongly agree). The MHLC produces three dimension scores: Internality (e.g., "I am in control of my health"), Powerful Others (e.g., "Health professionals keep me healthy"), and Chance Externality (e.g., "If it's meant to be, I will stay healthy"). Equivalent forms exist for this measure. Alpha reliabilities combined for forms A & B are between .830 and .859. Validation studies have generally supported the three factors of health locus of control, although it appears that the internality subscale is the most robust, and the chance externality is the weakest factor (Lewis, Morisky, & Flynn, 1978; Russel & Barrett, 1983). Average scores on the three factors have differed across populations. In a chronic medical patient sample ($\underline{n}$ = 609), Internality score averaged 25.78, Chance Externality 17.64 and Powerful Others 22.54 (Hartke & Kunce, 1982). In a sample of healthy community adults, Internality score averaged 25.55, Chance Externality 16.72 and Powerful Others 17.87 (Wallston, Wallston, & Devillis, 1978). The MHLC-Form A is presented in Appendix F.

Research Variables

Predictor Variables. The predictor variables included measures of fluid knowledge, depressed mood (CESD), health locus of control (MHLC), social support (SSQS), and medical/demographic variables. Medical and demographic variables included were age, sex, concurrent diagnoses, length of time on dialysis, and education. Age was defined as a person's age in years at the start of the study. Concurrent diagnoses was the total number of morbid conditions coexisting with ESRD. The particular diagnoses included in the total count were chosen based on the previous literature (Ruggiero, 1992) and included hypertension, congestive heart failure, diabetes mellitus, arteriosclertic cardiovascular disease, malignancy, liver disease, and systematic lupus erythematosus.

Criterion variables. The criterion variable for the retrospective study was baseline fluid adherence obtained by averaging the weekly means of the most recent three months of IWG. In the prospective study, the averaged weekly IWG, as well as CES-D and the three factors of the MHLC served as the measured criterion variables.

Procedure.

From three outpatient hemodialysis units eligible subjects were recruited from 16 pre-existing groups of subjects (designated by time and day of dialysis treatment). Random assignment of these "shifts" to two conditions were made. The compared groups were: 1) a compliance contingent group (CCG) and 2) an attention/control group (ACG). Therefore, every subject in a particular "shift" was in the same treatment condition.

Informed consent was obtained from all participants. Separate informed consent forms were given to the two experimental groups (Appendix A: Forms 1 and 2). All subjects were told they were participating in a study involving compliance to dialysis treatment regimens. Each subject had the opportunity to participate in monthly raffles for six months. Eight cash prizes per month were awarded, four for the CCG and four for the ACG. Baseline data were obtained prior to initiating treatment conditions. At baseline all subjects completed the following: Fluid Knowledge Questionnaire, Medical/Demographic Variables Questionnaire, SSQ, MHLC, and the CES-D. Baseline fluid adherence was obtained by averaging the weekly means of the most recent three months of IWG. The

Medical/Demographic Variables Questionnaire information was abstracted from a patient's medical chart and/or obtained by interview. At the end of one month of treatment, six months of treatment, and one month follow-up the CES-D and MHLC measures were repeated. The monthly average of weekly IWG as the measure of fluid adherence at each of these respective times. At baseline, subjects with scores on fluid knowledge questionnaires below two standard deviations from the mean were referred to the dietician who routinely provides education and treatment to all patients. Five subjects from each group had scores of 14 or lower and were referred.

During the course of the six-month treatment study, the ACG participants received a "raffle ticket" for each week. The CCG contracted to have intersession fluid weight gain of 7 kg or less per week. For each week a CCG participant obtained intersession weight gain criteria a raffle ticket was earned. Research assistants were present at the middle session of each week to give feedback to participants in each condition concerning their weight gain and distribute raffle tickets.

All participants were given specific instructions concerning weighing prior to their treatment session. Patients were instructed to take off extra clothing (e.g., jacket, sweater) or accessories (e.g., purse, keys) that may reduce reliability of weight measurement. Further, these instructions were posted above the scales at the dialysis center. Nursing staff recorded the weights of the patients.

Occasionally subjects had treatments on days other than their normal shift or missed treatment sessions. Subjects were advised to notify research assistants of any scheduled changes and were held to the 7 kg/week weight gain criteria if they were in the contingent reinforcement group.

RESULTS

Several methods of analysis were proposed to evaluate the hypotheses for the project's two studies. In the retrospective predictors study, correlational procedures and multiple regression procedures were proposed for the analyses. Multivariate analyses of variance were proposed to determine effects of the prospective intervention study. Descriptive statistics (i.e., means and standard deviations) for demographic/medical variables of the predictor study are presented in Table 1. In addition, simple statistics were also performed on the primary measures (i.e., MHLC, CES-D, Fluid Knowledge, SSQS, IWG) employed in the studies.

In this recruited sample, mean weekly IWG was 7.89 kg with 61% of the sample presenting with a weekly IWG over 7.00 kg. Knowledge of fluid restrictions for the dialysis regimen and perceived social support appeared sufficient, with mean score of 17.50 out of 20 on the Fluid Knowledge Questionnaire and 34.60 out of 36 on the SSQS. Ratings on the CES-D showed an average score of 12.93, with a range from 0 to 47. The three scale scores on the MHLC were: 26.42 Internal, 19.57 Chance External, and 25.91 Powerful Others and are comparable to values reported for other medical populations. These data are presented in Table 3.

Predictors Study Analyses.

To evaluate predictors of nonadherence to fluid restrictions as measured by averaged IWG, a 12 X 12 correlation matrix was generated using the following variables: age, months on dialysis, number of concurrent diagnoses, sex, fluid knowledge score, education, IWG, CES-D, SSQ, and three MHLC variables (Internality, Powerful Others, and Chance Externality). This correlation matrix generated 66 nonredundant correlation coefficients, allowing the unique relation between variables to be examined and is presented in Table 4.

A significant positive correlation was found between increased IWG and Sex-Male ($p < .01$). Significant negative correlations were found between IWG and CES-D ($p < .01$), and IWG and AGE ($p < .05$). Variables of SSQS, Fluid Knowledge, MHLCI, MHLCCE, MHLCPO, Education, Months on Dialysis, and Concurrent Diagnoses were not significantly correlated with IWG.

The correlation matrix generated intercorrelations and first-order correlations between IWG and the predictor variables, but multiple regression analyses allowed for examination of each variable while statistically controlling for the effects of other independent variables. A stepwise multiple regression was performed, given a lack of consistent predictor variables in the literature. Only the variables that were significant at $p < .15$ were entered into the regression equation. Variables were maintained in the equation if significant at the $p < .05$ level. The multiple regression equation provided answers to the following questions: 1) How well does the group of predictor variables estimate the criterion variable?; 2) How much does any single predictor variable add to the estimation of the criterion variable?; and 3) When all other predictor variables are held constant statistically, how much of the criterion variable does a given predictor variable account for? (Cohen & Cohen, 1983).

As displayed in Table 5, the stepwise multiple regression analysis for IWG noncompliance was significant, F (4, 136) = 6.30, $p < .001$. The equation accounted for 17% of the variance in IWG noncompliance. Inspection of this table shows that male SEX accounts for 8% ($p < .001$) of the variance, with AGE accounting for 3% ($p < .05$), MHLCCE contributing 3% ($p < .05$), and Education accounting for 3% ($p < .05$).

Intervention Study Analyses

To analyze the intervention study multivariate analyses of variance were conducted to answer hypotheses concerning treatment effects on IWG, health attitudes and beliefs, and depressed mood. Ninety-six participants completed the intervention study. Simple statistics of means, standard deviations, and frequencies for medical, demographic, and treatment variables were calculated for subjects who completed the intervention study and are presented in Table 6.

Pre-experimental analyses compared the intervention study participant characteristics between randomly assigned groups (CCG vs. ACG) by separate analyses of variance testing for significant group differences at baseline along the following variables: Medical and Demographic Variables, IWG, MHLC, SSQ, and CES-D. These results are presented in Table 7. The only variable significantly different between groups was Months on Dialysis, $\underline{F}$ $(1,95) = 3.46$, $\underline{p} < .01$. However, no significant relation between months on dialysis and IWG (see Table 4) were observed. Therefore randomly selected groups were considered adequately similar for intervention effects comparisons.

Table 8 presents frequencies of participants in each group who met weekly IWG criteria of 7.00 kg or less during the study. At baseline, 23 of the 53 CCG participants had weekly IWG of 7.00 kg or less, while 18 of the 43 ACG participants had weekly IWG of 7.00 kg or less. These values remained relatively consistent across treatment. CCG group participants received a raffle ticket contingently each week during a twenty week treatment when their weekly IWG was 7.00 kg or below. Members of this group received an average of 9.85 tickets throughout the course of the study. Three patients received a raffle ticket for each week of the study, while three patients never received a raffle ticket. Only 30% of the subjects earned a raffle ticket at least 15 of 20 weeks.

Approximately half of all subjects received a raffle ticket for 10 of twenty weeks. See Table 9.

A repeated measures multivariate analysis of variance (MANOVA) analyzed the effects of treatment on fluid adherence. The analysis was a 2 (Group) X 4 (Time) MANOVA, with the levels of Group being CCG and ACG and the levels of Time being baseline, one month into treatment, six months treatment, and one month post-treatment follow up. There was no significant Group X Time interaction, F (3,92) = 1.10, p= .35. The dependent variable was weekly fluid gain averages at baseline, one month treatment, six months treatment, and one month follow-up. Table 10 presents results showing that at one month treatment, six month treatment, and one month post-treatment follow up no significant group differences were present.

To evaluate the hypothesis that the treatment would enhance mood as measured by the CES-D, a repeated measures MANOVA was performed. The analysis was a 2 (Group) X 4 (Time) MANOVA, with the levels of Group being CCG and ACG and the levels of Time being baseline, one month treatment, six months treatment, and one month post-treatment follow up. There was no significant Group X Time interaction, F (3,70) = 1.35, p= .26. The dependent variable was CES-D averages at baseline, one month treatment, six months treatment, and one month follow up. Table 11 presents results showing that at one month treatment, six month treatment, and one month post-treatment follow up no significant group differences were present.

To evaluate the effect of the intervention on health attitudes and beliefs three separate repeated measures MANOVAs were performed for each of the three scores from the MHLC (i.e., Internality, Powerful Others, Chance Externality). The analyses were 2 (Group) X 4 (Time) MANOVAs, with the levels of Group being CCG and ACG and the levels of Time being baseline, one month treatment, six months treatment, one month post-treatment follow up. The dependent variables were the three scores of health locus of control at baseline, one month treatment, six months treatment, and one month follow up. Group X Time interactions were not significant for MHLCI, MHLCCE, or MHLCPO. The results of analyses comparing these variables across groups at each time are presented in Tables 12, 13 and 14.

Although there were no statistically significant interaction effects, there were changes in the data over time. A nonsignificant trend toward increased IWG over time was observed in both groups, $\underline{F}(3,92) = 2.34$, $\underline{p} = .08$. The ACG showing this effect more strongly (BSLN IWG $\underline{M} = 7.70$, 1 MO IWG $\underline{M} = 7.52$, 6 MO $\underline{M} = 8.30$, and F/U IWG $\underline{M} = 8.23$). These data are presented in Table 15. Scores of the CES-D rating depressed mood showed a general trend across groups towards less depressed mood, $\underline{F}\ (3,70) = 2.54$, $\underline{p} = .06$. These ACG group showed these changes over time (BLSN $\underline{M} = 13.42$, 1 MO $\underline{M} = 13.14$, 6 MO $\underline{M} =$

13.45, F/U $\underline{M}$ = 10.42). These data are presented in Table 15. A significant trend towards increased MHLCCE sores was observed in both groups, $\underline{F}$ (3,68) = 3.55, $\underline{p}$ = .02, with the ACG group demonstrating this effect more strongly (BSLN $\underline{M}$ = 19.14, 1 MO $\underline{M}$ = 20.86, 6 MO $\underline{M}$ = 21.95, F/U = 22.31). See Table 16 for these comparisons.

DISCUSSION

The goals of the current project were to gain knowledge of factors that contribute to noncompliance to the hemodialysis regimen of fluid restrictions and to evaluate the efficacy of a cost-effective and relatively long-term behavioral intervention to improve IWG compliance while measuring effects on health beliefs and attitudes. These goals were accomplished through two studies.

In one study, psychological and demographic/medical factors were evaluated for their capacity to predict noncompliance to fluid restrictions. In this prediction study, medical and demographic variables that were significant predictors included being male, younger in age, and having a higher level of education. Additionally, having a locus of health control that was high in chance external beliefs was associated with poorer compliance to the fluid restrictions required for hemodialysis patients. In the second study, treatment failed to produce significant changes in compliance. During this intervention study, neither group demonstrated significant reductions in IWG at any time during the six month study or one month post-treatment follow up.

The results of the predictor study are consistent with a portion of previous studies that have investigated predictors of noncompliance. This study replicates findings that being male or younger are associated with poorer fluid compliance (Cummings, et al., 1982; Oldenburg, MacDonald, & Perkins, 1988). At least one study, however, has found that women were more likely than men to be noncompliant to the treatment regimen (Hartmen & Becker, 1982). The present study found no relation to length of time on dialysis and fluid compliance supporting findings of Kirilloff (1981), although other studies have found that younger male patients on dialysis for a longer time are more noncompliant (Cummings, et al., 1982; Oldenburg, MacDonald, & Perkins, 1988; Ferraro, et al., 1986). Marital status and social support were found to be unrelated to nonadherence to fluid restrictions in this study. This lack of association supports findings of Cummings, et al. (1982), although being married and having high levels of social support were associated with better adherence to fluid regimen in study by Hartmen & Becker (1982). Similarly, being single or socially isolated has been found related to nonadherence in hemodialysis patients (Procci, 1978). In this study no relation was observed between number of concomitant medical problems and IWG. This finding is contrasted to the Ferraro, et al. (1986) study where patients with hypertension and other conditions were found more compliant to the regimen requests.

Level of education was found to be associated with poorer fluid compliance. In this study, patients with a higher level of education were found to have higher fluid weight gains. This result replicates findings of Blackburn (1977), although other studies have found inverse relations (Yanitski, 1983) or no relation (Ferraro, et al., 1986; Procci, 1981). Intuitively, a higher level of education would appear to prepare a person with knowledge that could help them to restrict fluid intake or to understand medical information presented to a greater extent. This idea was supported in this study given there was a significant positive correlation between fluid knowledge and education in the correlational analysis. However, no significant relation between fluid knowledge and IWG were observed in this study. Given the overall high level of knowledge concerning IWG and fluid restriction (recruited sample mean score was 17.5 out of 20 items correct on knowledge questionnaire) and the finding that higher education levels were related to fluid noncompliance, it could be deduced that knowledge and education are not the significant or singular component for compliance to fluid restrictions. Brantley, et al. (1990) made similar conclusions that knowledge is necessary although not sufficient for compliance based upon their treatment to improve vascular access cleansing compliance.

In the regression equation, health beliefs and attitudes measured as high in chance external locus of control (MHLCCE) predicted poor adherence to fluid restrictions. The finding that chance external locus of control is related to treatment noncompliance indirectly supports theory and previous findings that an internal locus of control compared to an external locus of control is preferable for adjustment to hemodialysis treatment

(Devins, et al., 1982; Poll & Kaplan-DeNour, 1982; Wenerowitz, et al., 1978).

Scores on the three factors of health locus of control (i.e., Internality, Chance External, Powerful Others) in this study are comparable to a sample of chronically ill medical patients (Hartke & Kunce, 1982), although this sample scored higher on average by two points than that sample in chance externality. Patients with a high degree of chance external locus of health control beliefs are likely to believe that treatment recommendations and health are related by chance rather than controlled by their own efforts. Having high rates of health attitudes and beliefs based upon circumstance would lower motivation to self-regulate behavior, and is consistent with poor adherence to a defined regimen.

This study found no relation between noncompliance and health beliefs and attitudes that were focused internally or with powerful others. The present sample did yield an expected high score on the Powerful Others factor as this finding has been reported in other studies of chronically ill patients (Hartke & Kunce, 1982). Such scores are not found in studies using "normal" healthy adults (Wallston, Wallston, & Devillis, 1978). Based upon the results of this study, a locus of control based upon chance is the most important health locus factor in predicting noncompliance to treatment regimens.

Depressed mood was significantly negatively correlated with noncompliance, but did not predict a significant portion of the variance of IWG. This negative association between mood symptoms and nonadherence means fewer symptoms of depressed mood are endorsed when a patient does not follow fluid restrictions. This finding replicates a previous study measuring depressed mood and IWG noncompliance in dialysis patients (Everett, et al., 1990) and is indirectly supported by the finding that compliant patients are found to be more frustrated and depressed than noncompliant patients (Yanitski, 1983). Another interpretation of this relation is that when patients feel good they are more noncompliant. In this study the average rating of depression was not in a clinically significant range, and should be considered mild by comparison to other populations (Weissman, 1977).

To summarize the results of the predictors study, being male, younger in age, better educated, and possessing an external health locus of control were found to significantly predict IWG noncompliance. These results add support to many previous predictor studies, and have the added methodological strength of a large sample size. The results should not be taken as conclusive or causal because the total variance of fluid noncompliance accounted for by this model was only 17%. These results are based upon an atheoretical stepwise model and therefore potentially capitalize on chance relations between variables. Replications of these results are needed to build stronger support for the idea that specific factors will predict noncompliance. Such knowledge would allow for the identification of high risk patients who could be targeted for early or more specialized treatments.

In the intervention study, no significant effects of treatment were observed at any point in the study. This finding refutes the hypothesis that treatment by weekly feedback and contracting for contingent reinforcement would outperform feedback and noncontingent reinforcement as a treatment modality to improve adherence rates for participants. No significant IWG changes were observed, and therefore hypotheses concerning long-term acquisition of compliance behaviors are unanswered. Additionally, no significant changes were observed in health locus of control variables or mood ratings at one month into treatment, six months into treatment, and at one month post-treatment. The lack of change in health beliefs and attitudes over the course of treatment does present as one plausible reason for why IWG adherence remained unchanged.

Previous literature reviewed revealed behavioral interventions to achieve fluid adherence in short-term treatment studies (Brantley, et al., 1990; Cummings, et al., 1981; Wolcott, 1986). One of theses studies reported success with a highly similar treatment that utilized raffle tickets as reinforcers for compliance with vascular access cleansing (Brantley, et al., 1990). Generally, these studies point to contingent reward as the essential component in achieving compliance. Results from this intervention project, however, suggest that feedback and contingent rewards as used in this study were not sufficient to produce behavior change in the direction of improved compliance.

One reason for poor treatment results may have been the low rate of reinforcement given to the treatment group. The schedule of reinforcement for patients in the contingency contract group was designed for possible reinforcement through receiving a raffle ticket one time per week for twenty weeks with four cash prizes per month drawn from these raffle tickets. Examination of the reinforcement schedule of the contingency contract group revealed that almost one-third of the subjects received raffle tickets only 5 times in 20 opportunities. On average, patients were earning and receiving reinforcements less than half of the weeks of treatment, and only three patients received reinforcement in the form of a raffle ticket every week of treatment. It is recognized that the more a behavior is reinforced, the more likely it will be emitted or maintained (Skinner, 1975). The low rate of reinforcement given in the contingency group may have greatly reduced the probability of a behavior change. In other words, targeted behaviors were reinforced so infrequently that the treatment group was given very little treatment (i.e., contingent reinforcement).

It is possible that a more frequent, immediate reward for compliance behavior would have strengthened compliance behaviors.

Rewarding IWG compliance with a raffle ticket on a session by session basis would have potentially increased reinforcement density. This type of intervention diverges from the minimal (in terms of labor intensity for staff) treatment that this study attempted. An alternative to the attempted intervention that would not have increased total treatment contact time is to have weekly raffles for less money. This would increase the rate of reinforcement (i.e., monetary reward), because potentially the participants could win one of twenty weekly drawings compared to one of six monthly drawings. These changes in rate of reinforcement may have provided more incentive for behavior change.

Although this project rewarded only one criterium weight, it might be beneficial to consider extending criteria for severe abusers of fluids. The majority of the patients in this project were not compliant to fluid restrictions at baseline as evidenced by a mean weekly IWG of 7.89 kg and only 44% of the contingency contract group reaching the compliance criterion of 7.00 kg at the initiation of the intervention study. The patient with 7.89 kg IWG would need to reduce weight by .89 kg over one week to reach compliance criterium and earn a raffle ticket. However, patients with high weekly IWG would perceive that more behavior changes and restrictions were necessary to reach criterium. Seventeen percent of the patients had weekly average weight gain over 10.00 kg per week. The external reward offered to these patients was probably perceived as not worth the effort of behavior change, and therefore decreased motivation to make an attempt to change to adherence behaviors. Future studies may need to consider instituting a changing criterion design to improve compliance based upon each individual's weight. This method would enhance opportunities for positive reinforcement and, again, provide incentive for behavior change.

Similarly, this treatment intervention assumed that all participants would actively try to reduce or maintain their IWG to the criterium. Recent studies evaluated stages of behavior changes in smoking cessation, weight loss, exercise, and other preventive or maintenance behaviors have found that only a small percentage of these patient groups are prepared to take action, and many are in stages of precontemplation or contemplation to make behavior changes (Prochaska & Marcus, in press). It is possible that the active treatment administered to the entire intervention group did not match well to individuals' readiness to make changes necessary to comply with fluid restrictions. Evaluating a person's readiness to change to fluid compliance behaviors would appear to be a useful assessment prior to intervention. Those patients desiring to change could be entered into an intervention study, while those in precontemplative or contemplative stages of desire for change could be given less overwhelming treatments or education that could motivate them in the direction of becoming active in change behaviors. This type of study would necessitate a very large sample to have sufficient statistical power to evaluate action-related treatment components.

During the course of the project, baseline ratings of depressed mood indicated only mild symptoms (group averages of 13.42 and 13.86 out of a possible score of 60), and these symptom ratings decreased nonsignificantly over the time of the study. This finding and the results of the correlation analysis in the predictors study suggested that emotional variables of depression were unrelated or inversely related to fluid compliance. These results are supported by recent studies that found cognitive variables of perceived success and control as mediating of factors of compliance rather than emotional variables (Schneider, et al., 1991; Rosenbaum & Ben-Ari Smira, 1986). The findings in this study should be interpreted with caution, however, as the treatment intervention had no effect on the targeted variable of IWG, and any relation between CES-D and IWG could be spurious.

Another methodological reason for the lack of response to the treatment could have been the subject criterium for inclusion into the study. The patients of this sample appear different in some characteristics than previous studies reported in the literature. This group as a whole had a lower level of education, fewer married participants, a higher percentage of black patients, lower per capita income, and a higher unemployment rate than other studies have reported in national and regional samples (Cummings, et al., 1982; Kirilloff, 1983; Blackburn, 1978). Additionally, this sample on average was higher in unemployed participants, blacks, unmarried subjects, and patients had more concurrent medical diagnoses than did samples studied in the same dialysis units previously (Everett, 1989; Ruggiero, et al., 1992; Mosley, et al., 1992).

The liberal inclusion criterium allowed for the methodological advantage of a large sample. However, this sample, being different in many respects from others, may not have responded in similar ways to an intervention similar to one found successful in previous studies. This group may represent a particularly difficult sample to elicit behavior change. The majority of psychological behavior change literature has been developed in college or middle-class populations. This chronically ill, minority, impoverished sample may respond differently to efforts to change behaviors. In particular, such a sample may represent a poor choice for testing the effectiveness of a cost-effective, minimal treatment effort type of intervention.

Finally, other methodological issues should be considered as possible reasons for a lack of results. The lack of significant treatment effect is not likely due to insufficient sample size or statistical power. In fact, the recruited sample represents one of the largest of its type in the field. In studying intersession weight gain the recommendations of Ferraro, et al. (1986) were followed because continuous variables were not dichotomized, a clearly defined parameters of compliance criterium was identified, and an adequate sample size was recruited. It is recognized that weight gain is an indirect measure of fluid regimen adherence and can be affected by physiological functions such as perspiration rates or residual kidney function. Patients were excluded from this study if they reported a significant residual kidney function as an attempt to control for this error in measurement. However, in one study patients with residual kidney function were not significantly more compliant to fluid restrictions (Blackburn, 1977). Direct observation of fluid consumption would represent the ideal measure of adherence to fluid restrictions, but it is highly impractical to monitor compared to other behaviors (e.g., vascular access cleansing).

This project demonstrated the need to recruit a sufficiently large sample if an intervention is to be studied over time. Forty-five participants were lost for various reasons during the course of this study. Many of these losses were beyond the control of the investigator (e.g., transplant, hospitalizations, death, moving). Additionally, even with research assistants offering assistance, refusal rates by patients to complete measures were prevalent. Future studies should plan on similar attrition rates.

In summary, this project identified four variables (being male, younger, being better educated, and having health beliefs and attitudes that are based upon chance events) as predictors of fluid noncompliance. These findings should be accepted conservatively, and future studies are needed to validate these results. The intervention study tested effects of contingent versus noncontingent reward to achieve long-term adherence to fluid restrictions and was ineffective in changing behavior. The intervention may not have reinforced group participants at a rate sufficient to produce change to compliance behaviors. Likewise, the present sample may have represented a difficult group on which to attempt a minimal effort treatment. Further efforts need to employ stronger treatment techniques that will increase reinforcement opportunities that can be an incentive for behavior change.

REFERENCES

Abram, H.S. (1974). Psychiatric reflections on adaptation to repetitive dialysis. Kidney International, 6, 67-72.

Acchiardo, S. Moore, L.W., & Cockrell, S. (1984). Does low-protein diet halt the progression of renal insufficiency? Proceedings of IXth International Congress of Nephrology, 307A.

Andreoli, T.E. (1985). Disorders of fluid volume, electrolyte, and acidbase balance. In J.B. Wyngaard, Textbook of Medicine. Philadelphia: W.B. Saunders Co.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. Psychological Review, 84, 191-215.

Battista, L. (1979). Hemodialysis. In F.P. Hekelman & C.A. Ostendarp (Eds.), Nephrology Nursing: Perspectives Of Care (pp. 120-202). New York: McGraw-Hill Book Company.

Becker, M., & Maiman, L.A. (1975). Sociobehavioral determinants of compliance with health and medical care recommendations. Health Care, 13, 10-24.

Bergstrom, J., & Furst, P. (1983). Uraemic toxins. In W. Dukker, F.M. Parsons, & J.F. Maher (Eds.), Replacement of Renal Function by Dialysis (pp. 354-390). Boston: Martinus Nijhoff Publishers.

Bigelow, G., Strickler, D., Liebson, I., & Griffiths, R. (1976). Maintaining disulfiram ingestion among outpatient alcoholics: A security-deposit contingency contracting procedure. Behavior Research and Therapy, 14, 378-381.

Binik, Y.M., Devins, G.M., & Orme, C.M. (1989). Psychological stress and coping in end-stage renal disease. In Nuefeld (Ed.), Advances in the Investigation of Psychological Stress. New York: Wiley.

Blackburn, S.L. (1977). Dietary compliance of chronic hemodialysis patients. Journal of the American Dietetic Association, 70, 31-37.

Blagg, C.R. (1983). Acute complications associated with hemodialysis. In W. Dukker, F.M. Parsons, & J.F. Maher (Eds.), Replacement of Renal Function by Dialysis (pp. 611-629). Boston: Martinus Nijhoff Publishers.

Blanchard, E.B. (1987). Long-term maintenance and follow-up in behavioral medicine. Behavior Therapy, 18, 295-296.

Bollin, B.W., & Hart, L.K. (1982). The relationship of health belief motivations, health locus of control and valueing to dietary compliance of hemodialysis patients. American Association of Nephrology Nurses and Technicians Journal, 41-47.

Bommer, J., Tschope, W., Ritz, E., & Andrassy, K. (1976). Sexual behavior of hemodialyzed patients. Clinical Nephrology, 6, 315-318.

Brantley, P.J., Mosley, T.H., Bruce, B., McKnight, G.T., & Jones, G.N., (1990). Efficacy of patient education and behavioral management on handwashing compliance in hemodialysis patients. Health Psychology, 9, 103-113.

Brownell, K.D., & Jeffrey, R.W. (1987). Improving long-term weight-loss: pushing the limits of treatment. Behavior Therapy, 18, 353-374.

Burish, T.G., & Bradley, L.A. (1983). Coping with chronic disease: definitions and issues. In T.G. Burish & L.A. Bradley (Eds.), Coping with Chronic Disease: Research and Applications, (pp. 3-12). New York: Academic Press, Inc.

Burton, H.J., Kline, S.A., Lindsay, R.M., & Heidenheim, A.P. (1986). The relationship of depression to survival in chronic renal failure. Psychosomatic Medicine, 48, 261-269.

Butt, K.M.H. (1983). Angioaccess. In W. Dukker, F.M Parsons, & J.F Maher (Eds.), Replacement of renal function by dialysis (pp. 171-185). Boston: Martinus Nijhoff Publishers.

Cameron, S. (1986). Kidney disease: The facts. New York: Oxford University Press.

Caron, H.S., & Roth, H.P. (1968). Patient's cooperation with medical regimen: Difficulties in identifying the noncooperator. Journal of the American Medical Association, 203, 120-124.

Cheek, J.N. (1982). Patient feelings about illness: Do they affect compliance with the therapeutic regimen? American Association of Nephrology Nurses and Technicians, October, 17-20.

Christensen, A.J., Smith, T.W., Turner, C.W., Holman, J.M., & Gregory, M.C. (1990). Type of hemodialysis and preference for behavioral involvement: Interactive effects on adherence in end-stage renal disease. Health Psychology, 9, 225-236.

Cohen, J., & Cohen, P. (1983). Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences pp. 85-86. Hillsdale, NJ: Earlbaum.

Comty, C.M., & Shapiro, F.L. (1983). Cardiac complications of regular dialysis therapy. In W. Drukker, F.W. Parsons, & J. F. Maher (Eds.), Replacement of renal function by dialysis. Boston: Martinus Nijhoff Publishers.

Cooke, C.J., & Meyers, A. (1980). The role of predictor variables in the behavioral treatment of obesity. Behavioral Assessment, 2, 59-69.

Cummings, K.M., Becker, M.H., Kirscht, J.P., & Levin, N.W. (1982). Psychosocial factors affecting adherence to medical regimens in a group of hemodialysis patients. Medical Care, 20, 567-580.

Cummings, K.M., Becker, M.H., Kirscht, J.P., & Nathan, W.L. (1981). Intervention strategies to improve compliance with medical regimens by ambulatory hemodialysis patients. Journal of Behavioral Medicine, 4, 111-127.

Cummings, K.M., Kirscht, J.P., Becker, M.H., & Levin, N.W. (1984). Construct validity comparisons of three methods for measuring patient compliance. Health Sciences Research, 19, 103-116.

Davidson, P.O. (1982). Issues in patient compliance. In T. Millon, C. Green, & R. Meagher (Eds), Handbook of clinical health psychology. New York: Plenum.

Delano, B.G. (1983). Regular dialysis adjustment treatment. In W. Dukker, F.M. Parsons, and J.F. Maher (Eds.), Replacement of renal function by dialysis. Boston: Martinus Nijhoff Publishers.

DeNour, A.K. (1982). Psychosocial adjustment to illness scale (PAIS): A study of chronic hemodialysis patients. Journal of Psychosomatic Research, 18, 217-221.

DeNour, A.K., & Czaczkes, J.W. (1972). Personality factors in chronic hemodialysis patients causing noncompliance with medical regimen. Psychosomatic Medicine, 34, 333-344.

DeNour, A.K., & Czaczkes, J.W. (1976). The influence of patient's personality on adjustment to chronic dialysis: A predictive study. The Journal of Nervous and Mental Disease, 162, 323-333.

Devins, G.M., Binik, T.M., Hollonby, D.J., Barre, P.E., & Guttman, R.D. (1981). Helplessness and depression in end-stage renal disease. Journal of Abnormal Psychology, 90, 531-545.

DiMatteo, M.R., & DiNicola, D.D. (1982). Achieving patient compliance: The psychology of the medical practitioners role. New York: Pergamon Press.

Dunbar, J., Marshall, G., & Hovell, M. (1979). Behavioral strategies for improving compliance. In R.B. Haynes, D.W. Taylor, & D.L. Sackett (Eds.), Compliance in Health Care (pp 174-190). Baltimore: The John Hopkins University Press.

Eggers, P.W. (1988). Effect of transplantation on the medicare end stage renal disease program. The New England Journal of Medicine, 318, 223-229.

Engel, G.L. (1977). The need for a new medical model: A challenge for biomedicine. Science, 196, 129-136.

Epstein, L.H. & Cluss P.A. (1982). A behavioral medicine perspective on adherence to long-term medical regimens. Journal of Consulting and Clinical Psychology, 50, 950-971.

Epstein, L.H. (1981). The effects of targeting improvements in urine glucose on metabolic control in children with insulin dependent diabetes. Journal of Applied Behavior Analysis, 14, 365-376.

Eschbach, J.W. (1983). Hematologic problems of dialysis patients. In W. Dukker, F.M. Parsons, & J.F. Maher (Eds.), Replacement of renal function (pp. 630-645). Boston: Martinus Nijhoff Publishers.

Everett, K.D., Brantley, P.J., Garrett, V.D., Jones, G.N., & McKnight, G.T. (1990). The impact of stress on depression in hemodialysis patients. A poster presented at the meeting of the Society of Behavioral Medicine, Chicago.

Feinstein, E.I. (1986). Nutritional therapy in maintenance hemodialysis patients. In A.R. Nissenson & R.N. Fine (Eds.), Dialysis Therapy. Philadelphia: Hanley & Belfus, Inc.

Ferraro, K.F., Dixon, R.D., & Kinlaw, B.J.R. (1986). Measuring compliance among in-center hemodialysis patients. Dialysis and Transplantation, 15, 226-266.

Finn, P.E., Alcorn, J.D., Hollandsworth, J.G., & Hendley, E. (1985). Hemodialysis dietary noncompliance: An empirical investigation of a treatment package. Paper presented at the meeting of the Association for the Advancement of Behavior Therapy, Houston.

Finn, P.E., & Alcorn, J.D. (1986). Noncompliance to hemodialysis dietary regimens: Literature review and treatment recommendations. Rehabilitation Psychology, 31, 67-78.

Gerber, K.E. (1986). Compliance in the chronically ill: An introduction to the problem. In K.E. Gerber & A.M. Nehemkis (Eds.), Compliance the Dilemma of the Chronically Ill (pp. 12-23). New York: Springer Publishing Co.

German, P.S. (1988). Compliance and chronic disease. Hypertension Supplement, 11, 56-60.

Gibbons, F.X., McGovern, P.G., Lando, H.A. (1991). Relapse and risk perception among members of smoking cessation clinic. Health Psychology, 10, 42-45.

Glasgow, R.E., & Lichtenstein, E. (1987). Long-term effects of behavioral smoking cessation programs. Behavior Therapy, 18, 297-324.

Golden, J., & Milne, J. (1978). Somatopsychic sexual problems of renal failure. Dialysis and Transplantation, 1, 879-890.

Grady, K.E., Goodenow, C., & Borkin, J.R. (1988). The effect of reward on compliance with breast self-examination. Journal of Behavioral Medicine, 11, 43-58.

Haenel, T., Brunner, F., & Battegay, R. (1980). Renal dialysis and suicide: Occurrence in Switzerland and in Europe. Comprehensive Psychiatry, 21, 140-145.

Hartke, R.J., & Kunce, J.T. (1982). Multidimensionality of health locus of control scale items. Journal of Consulting and Clinical Psychology, 50, 594-595.

Hartman, P.E., & Becker, M.H. (1978). Noncompliance with prescribed regimen among chronic hemodialysis patients. Dialysis & Transplantation, 7, 978-985.

Haynes, R.B (1979). Introduction. In R.B. Haynes, D.W. Taylor, & D.L. Sackett (Eds.), Compliance in Health Care (pp. 1-7). Baltimore: The Johns Hopkins University Press.

Haynes, R.B. (1982). Improving patient compliance: An empirical view. In R.B. Stuart (Ed.), Adherence, compliance and generalization in behavioral medicine. New York: Brunner/Mazel.

Haynes, R.B., Sackett, D.L., Gibson, E.S., Taylor, D.W., Hackett, B.C., Roberts, R.S., & Johnson, A.L. (1976). Improvement of medication compliance in uncontrolled hypertension. Lancet, 1, 1265-1268.

Hegel, M.T., Ayllon, T., Oulton, B.R., & Thiel, G. (1989). Contingent health belief modification versus positive reinforcement for improving adherence in hemodialysis patients. Paper presented at the meeting of the Association for the Advancement of Behavior Therapy, Washington D.C.

Heitzmann, C.A., & Kaplan, R.M. (1988). Assessment of methods for measuring social support. Health Psychology, 7, 75-109.

Hirschman, G.H., Wolfson, M., Mosemann, J.E., Clark, C.B., Dante, M.L., & Wineman, R.J. (1981). Complications of dialysis. Clinical Nephrology, 15, 66-74.

Hitchcock, P.B., Brantley, P.J., Garrett, V.D., Jones, G.N., & McKnight, G.T. (1990). The impact of stress and social support on compliance in hemodialysis patients. A poster presented at the meeting of the Society of Behavioral Medicine, Chicago.

Hoover, H. (1989). Compliance in hemodialysis patients: A review of the literature. Journal of the American Dietetic Association, 89, 957-959.

Huber, J.W., & Tucker, C.M. (1984). Criteria for good adjustment to chronic hemodialysis: Nurse patient differences. Rehabilitation Psychology, 29, 147-158.

Hunt, W.A., & Bespalec, D.A. (1974). An evaluation of current methods of modifying smoking behavior. Journal of Clinical Psychology, 30, 431-438.

Hunt, W.A., & Matarazzo, J.D. (1971). Three years later: Recent developments in the experimental modification of smoking behavior. Journal of Clinical Psychology, 27, 455-56.

Jameson, M.D., & Wiegmann, T.B. (1990). Principles, uses, and complications of hemodialysis. Medical Clinics of North America, 74, 945-961.

Janz, N., & Becker, M. (1984). The health belief model: A decade later. Health Education Quarterly, 11, 1-47.

Jennekins, F.G., & Jennekins-Schinkel, A. (1983). Neurological aspects of dialysis patients. In W. Dukker, F.M. Parsons, & J.F. Maher (Eds.), Replacement of renal function (pp. 724-741), Boston: Martinus Nijhoff Publishers.

Johnson, D.R., & Creech, J.C. (1983). Ordinal measures in multiple indicator models: A simulation study of categorization error. American Sociology Review, 48, 398-407.

Kanfer, F.H. (1979). Self-management: Strategies and tactics. In A.P. Goldstein & F.H. Kanfer (Eds.), Maximizing treatment gains. New York: Academic Press.

Kasl, S. (1975). Issues in patient adherence to health care regimens. Journal of Human Stress, 1, 5-17.

Keane, T.M., Prue, D.M., & Collins, F.L. (1981). Behavioral contracting to improve dietary compliance in chronic renal dialysis patients. Journal of Behavior Therapy and Experimental Psychiatry, 12, 63-67.

Keefe, F.J., & Blumenthal, J.A. (1982). Behavioral medicine: Basic principles and theoretical foundations. In F.J. Keefe & J.A. Blumenthal (Eds), Assessment strategies in behavioral medicine. New York: Grune & Gratton.

Kirilloff, L.H. (1981). Factors influencing the compliance of hemodialysis patients with their therapeutic regimen. American Association of Nephrology Nurses and Technicians, August, 15-20.

Kirschenbaum, D.S., Sherman, J., & Penrod, J.D. (1987). Promoting self-directed hemodialysis: Measurement and cognitive-behavioral intervention. Health Psychology, 6, 373-385.

Kirscht, J., & Rosenstock, I. (1979). Patients' problems in following recommendations of health experts. In G. Stone, F. Cohen, & N. Adler (Eds.), Health psychology: A handbook. San Francisco: Jossey-Bass Publishers.

Kokko, J. (1988). Chronic renal failure. In J.B. Wyngaarden, & L.H. Smith (Eds.), Cecil textbook of medicine (pp. 563-573). Phildelphia: W.B. Saunders Co.

Kopple, J.D. (1984). Chronic renal failure: Nutritional and nondialytic management. In R.J. Glassock (Ed.), Current therapy in nephrology and hypertension 1984-1985. Philadelphia: B.C. Decker, Inc.

Kutner, N.G., Fair, P.L., & Kutner, M.H. (1985). Assessing depression and anxiety in chronic dialysis patients. Journal of Psychosomatic Research, 29, 23-31.

Lando, H.A. (1981). Effects of preparation, experimenter contact, and a maintained reduction alternative on a broad-spectrum program for eliminating smoking. Addictive Behaviors, 6, 123-133.

Lazarus, J.M. (1981). Hemodialysis in chronic renal failure. In B.M Brenner and J.H. Stein, (Eds.), Chronic Renal Failure. New York: Churchill Livingston.

Lazarus, J.M., & Hakim, R.M. (1991). Medical aspects of hemodialysis. In B.M. Brenner & F.C. Rector (Eds.) The Kidney. Philadelphia: W.B Saunders Co.

Leventhal, H., & Cameron, L. (1987). Behavioral theories and the problem of compliance. Patient Education and Counseling, 10, 117-138.

Leventhal, H., & Cleary, P. (1980). The smoking problem: A review of the research and theory in behavioral risk reduction. Psychological Bulletin, 88, 370-405.

Leventhal, H., Zimmerman, R., & Gutmann, M. (1984) Compliance: A self-regulation perspective. In W.D. Gentry (Ed.), Handbook of Behavioral Medicine. New York: Guilford Press

Levy, N.B. (1983). Social support and compliance: A selective review and critique of treatment integrity and outcome measure. Social Science Medicine, 17, 1329-1338.

Lewis, F.M., Morisky, D.E., & Flynn, B.S. (1983). A test of construct validity of health locus of control: Effects on self-reported compliance for hypertensive patients. Health Education Monographs, 6, 138-148.

Ley, P. (1977). Psychological studies of doctor-patient communication. In S. Rachman (Ed), Contributions to medical psychology, Vol 1. Oxford: Pergamon Press.

Longo, E.D. (1981). Psychosocial responses to chronic hemodialysis. Physician Assistant & Health Practitioner, 1, 26-30.

Luke, R.G. (1988). Dialysis. In J.B. Wyngaarden & L.H. Smith (Eds.), Cecil Textbook of Medicine (pp. 573-577). Philadelphia: W.B. Saunders Co.

Mahoney, M., & Mahoney, J. (1976). Permanent Weight Control. New York: Norton.

Maiman, L.A., & Becker, M.H. (1974). The health beliefs model: Origins and correlates in psychological theory. Health Education Monographs, 2, 336-353.

Manley, M., & Sweeney, J. (1986). Assessment of compliance in hemodialysis adaptation. Journal of Psychosomatic Research, 30, 153-161.

Marlatt, G.A., & Gordon, J.R. (eds) (1985). Relapse prevention: Maintenance strategies in the treatment of addictive behaviors. New York: Guilford.

Mathews, D., & Hingson, R. (1977). Improving patient compliance, a guide for physicians. Medical Clinics of North america, 61, 879.

Mazur, F.T. (1981). Adherence to health care regimens. In C.K. Prokop & L.A. Bradley (Eds.), Medical psychology: Contributions to behavioral medicine. New York: Academic Press.

Meichenbaum, D.H., & Turk, D.C. (1982). Stress, coping, and disease: A cognitive behavioral perspective. In R.W.J Neufeld (Ed), Psychological stress and psychopathology. New York: McGraw-Hill.

Mosely, T.H., Brantley, P.J., Jones, G.N., McKnight, G.T. (1992). Predicting compliance of in-center patients to vascular access cleansing recommendations. Dialysis and Transplantation, 21, 216-225.

O'Brien, M.B. (1980). Hemodialysis regimen compliance and social environment. Nursing Research, 29, 250-255.

Orme, J.G., Reis J., & Herz, E.J. (1986). Factorial and discriminant validity of the Center for Epidemiological Studies Depression (CES-D) scale. Journal of Clinical Psychology, 42, 28-33.

Palakoff, S. (1983). Dialysis associated with hepatitis. In W. Dukker, F.M. Parsons, & J.F. Maher (Eds.), Replacement of renal function, (p. 659-678). Boston: Martinus Nijhoff Publishers.

Pinkerton,S., Hughes, H., & Wenrich, W.W. (1982). Behavioral medicine: Clinical applications. New York: Wiley.

Poll, I.B., & DeNour, K.A. (1980). Locus of control and adjustment to chronic haemodialysis. Psychological Medicine, 10, 153-157.

Procci, W.R. (1978). Dietary abuse in maintenance hemodialysis patients. Pychosomatics, 19, 16-24.

Procci, W.R. (1981). Psychological factors with severe abuse of the hemodialysis diet. General Hospital Psychiatry, 3, 111-118.

Prochaska, J.O, & Marcus, B.H. (in press). The transtheoretical model: Applications to exercise. In R. Dishman (Ed.), Exercise Adherence II, Illinois: Human Kinetics Press.

Radloff, L.S. (1977). The CES-D scale: A self-report depression scale for research in the general population. Applied Psychological Measurement, 1, 385-401.

Rappoff, M.A., & Christophersen, E.R. (1982). Compliance of pediatric patients with medical regimens: A review and evaluation. In R.B. Stuart (Ed.), Adherence, compliance , and generalization in behavioral medicine (pp. 79-123). New York: Brunner/Mazel, Inc.

Rodriguez, D.J., & Hunter, V.M. (1981). Nutritional intervention in the treatment of chronic renal failure. Nursing Clinics of North America, 16, 573-585.

Robertson, G.L. & Berl, T. (1986). Water metabolism. In B.M Brenner & F.C. Rector (Eds.), The Kidney. Philadelphia: W.B. Saunders

Ruggiero, L., Brantley, P.J., Bruce, B.K., McKnight, G.T., Cocke, T.B. (1992). The role of dietary compliance in survival of hemodialysis patients. Dialysis and Transplantation, 21, 14-17.

Russell, S.F., & Ludenia, K. (1983). The psychometric properties of the multidimensional health locus of control scales in an alcoholic population. Journal of Clinical Psychology, 39, 453-459.

Salmons, P.H. (1980). Psychosocial aspects of chronic renal failure. British Journal of Hospital Medicine, 16, 29-34.

Sarason, I.G., Sarason, B.R., Shearin, E.N., & Pierce, G.R. (1987). A brief measure of social support: Practical and theoretical implications. Journal of Social and Personal Relationships, 4, 497-510.

Sarason, I.G., Levine, H.M., Basham, R.B., Sarason, B.R. (1983). Assessing social support: The Social Support Questionnaire. Journal of Personality and Social Psychology, 44, 127-139.

Seime, R.J. (1980). The relationship of compliance, self-reported feelings and symptoms, and staff attention in dialysis. In D.J. Withersty, & J.M. Stevenson (Eds.), Communication and Compliance in a Hospital Setting (pp. 65-90). Springfield, Illinois: Charles C. Thomas-Publisher.

Schneider, M.S., Friend, R., Whitaker, P., Wadhwa, N.K. (1991). Fluid noncompliance and symptomatology in end-stage renal disease: Cognitive and emotional variables. Health Psychology, 10, 209-215.

Sheiner, L.B., Rosenbeg, B., Marathe, V.V., & Peck, C. (1974). Differences in serum digoxin concentrations between outpatients and inpatients: An effect of compliance? Clinical Pharmacology and Therapeutics, 15, 239-246.

Skinner, B.F. (1975). The steep and thorny way to a science of behavior. American Psychologist, 30, 42-49.

Skoutakis, V.A., Acchiardo, S.R., Martinez, D.R., Lorisch, D., & Wood, G.C. (1978). Role effectiveness of the pharmacist in the treatment of hemodialysis patients. American Journal of Hospital Pharmacy, 35, 62-65.

Sobell, M., & Sobell, L. (1973). Alcoholics treated by individualized behavior therapy: One year treatment outcome. Behaviour Research and Therapy, 11, 599-618.

Soutter, B.R., & Kennedy, M.B. (1974). Patient compliance assessment in drug trials: Usage and methods. Australian-New Zealand Journal of Medicine, 4, 360-364.

Stewart, R.S. (1985). Psychiatric issues in renal dialysis transplantation. Hospital and Community Psychiatry, 34, 623-628.

Stodola, E., & Miller, T.W. (1989). End-stage renal disease as a stressful event. In T.W. Miller (Ed.), Stressful Life Events. Madison, Connecticut: International Universities Press.

Stunkard, A. (1979). Behavioral medicine and beyond: The example of obesity. In O.F. Pomerleau & J.P. Brady (Eds), Behavioral medicine: Theory and practice. Baltimore: Williams & Wilkins.

Tucker, C.M., Ziller, R.C., Chennault, S.A., Somer, E., Schwartz, M.G., Swanson, L.L., Blake, H.A., & Finlayson, G.C. (1987). Adjustment to hemodialysis treatment through behavioral controls. Journal of Psychopathology and Behavioral Assessment, 9, 219-227.

Tucker, C.M., Desmond, F.F., Hellmich, L.K., Cohen, J.L., & Caesar, C.A. (1990). The effects of behavioral interventions with patients, nurses, and family members on fluid nonadherence of chronic hemodialysis patients. Paper presented at the Association for the Advancement of Behavior Therapy, San Francisco.

Turk, D.C., Salovey, P., & Litt, M. (1986). Adherence: A cognitive-behavioral perspective. In K.E. Gerber & A.M. Nehemis (Eds), Compliance: the dilemma of the chronically ill. New York: Springer Publishing Company.

Wallston, K.A., Wallston, B.S., & DeVillis, R. (1978). Development of the multidimensional health locus of control (MHLC) scales. Health Education Monographs, 6, 161-171.

Weissman, M.M., Sholomskas, D., Pottenger, M., Prusoff, B.A., Locke, B.Z (1977). Assessing depressive symptoms in five psychiatric populations: A validation study. American Journal of Epidemiology, 106, 203-214.

Wenerowicz, W.J., Riskind, J.H., & Jenkins, P.G. (1978). Locus of control and degree of compliance in hemodialysis patients. Journal of Dialysis, 2, 495-505.

Whitenberg, S.H., Blanchard, E.B., McCoy, G., Suls, J., & McGoldrick (1983). Evaluation of compliance in home and center hemodialysis patients. Health Psychology, 2, 227-237.

Wing, R.R., Epstein, L.H., Nowalk, M.P., & Scott, N. (1988). Self-regulation in the treatment of type II diabetics. Behavior Therapy, 19, 11-25.

Wolcott, D.L., Maida, C.A., Diamond, R., Nissenson, A.R. (1986). Treatment compliance in end-stage renal disease patients on dialysis. American Journal of Nephrology, 6, 329-338.

Wolfson, M. (1984). Nutrition in hemo- and peritoneal dialysis patients. In A.R. Nissenson, R.N. Fine, & D.E. Gentile (Eds.), Clinical Dialysis. Norwalk, Connecticut: Appleton-Century-Crofts.

Yanagida, E.H., Streltzer, J. & Siemsen, A. (1981). Denial in dialysis patients: Relationship to compliance and other variables. Psychosomatic Medicine, 43, 271-280.

Yanitski, A.E. (1983). Compliance of the hemodialysis patient. American Association of Nephrology Nurses and Technicians Journal, 11-16.

APPENDIX A

INFORMED CONSENT FORMS

RESEARCH PROJECT: Compliance in Hemodialysis Patients

INVESTIGATORS: Kevin D. Everett; Christopher Sletten

Informed Consent: Form 1

I, ____________________________, freely and willingly consent to be a participant in a research project investigating compliance in hemodialysis patients. As a participant, I agree to complete several paper and pencil questionnaires including a dialysis knowledge questionnaire, the Center for Epidemiologic Studies Depression Scale, the Multidimensional Health Locus of Control Scale, and a Social Support Questionnaire at different occasions throughout a seven month study. Additionally, I agree to allow research assistants to review any of my pertinent medical records. I understand that there are no anticipated risks involved by participation in this study.

I agree to keep my intersession weight gain total for each week at 7 kilograms or below. If my weight gain reaches this criterion, I will receive a raffle ticket for that particular week. If I gain more than 7 kilograms total between sessions for the week I will not receive a raffle ticket. At the end of each month (4 weeks), all raffle tickets will be placed in a drawing and winning ticket holders will receive a fifty dollar cash prize.

I understand that I may withdraw from participation in this study at any time with no adverse consequences. In addition, any information I provide during this study will be kept in strict confidence, and if this information is presented publicly (i.e., conferences, journal articles), no information will be identified with me personally.

I realize that I have a right to ask questions at any time and to have my questions answered to my satisfaction. By signing, I freely provide my consent to participate in the study.

______________________ Participant	______________ Subject Number
______________________ Witness	______________ Date

RESEARCH PROJECT: Compliance in Hemodialysis Patients

INVESTIGATORS: Kevin D. Everett; Christopher Sletten

Informed Consent: Form 2

I, ___________________________, freely and willingly consent to be a participant in a research project investigating compliance in hemodialysis patients. As a participant, I agree to complete several paper and pencil questionnaires including a dialysis knowledge questionnaire, the Center for Epidemiologic Studies Depression Scale, the Multidimensional Health Locus of Control Scale, and a Social Support Questionnaire at different occasions throughout a seven month study. Additionally, I agree to allow research assistants to review any of my pertinent medical records. I understand that there are no anticipated risks involved by participation in this study.

As a result of participating in this study I will receive a weekly raffle ticket, that will be place in a drawing at the end of each month (4 weeks) for six consecutive months. Winning ticket holders will receive a fifty dollar cash prize.

I understand that I may withdraw from participation in this study at any time with no adverse consequences. In addition, any information I provide during this study will be kept in strict confidence, and if this information is presented publicly (i.e., conferences, journal articles), no information will be identified with me personally.

I realize that I have a right to ask questions at any time and to have my questions answered to my satisfaction. By signing, I freely provide my consent to participate in the study.

______________________ Participant	______________________ Subject Number
______________________ Witness	______________________ Date

APPENDIX B

MEDICAL/DEMOGRAPHIC INFORMATION

QUESTIONNAIRE

DEMOGRAPHIC/MEDICAL DATA

Subject Name__________________________ ID#_________

Age________ Sex__________ Race/Ethnic________

Occupation__________________ Current Job Status___________

Marital Status: 1-single 2-married 3-divorced
4-widowed 5-separated

Number of persons in Household (including yourself):______

Annual Income: ___________
1- less than 5,000
2- 5001 - 10,000
3- 10,001 - 15,000
4- 15,001 - 25,000
5- 25,001 - 50,000
6- 50,001 - 100,000
7- 100,000+

Education Completed:______________________
1- less than 7 years of school
2- Junior High School
3- Partial High School
4- High School Graduate
5- Partial College Training
6- College or University Degree
7- Graduate or Professional Training

Years/Months on Dialysis: ___________

Dialysis Diagnosis: Ht. _____

Concurrent Diagnoses:
1. Hypertension Wt. _____
2. Congestive Heart Failure
3. Diabetes Mellitis
4. Arteriosclerotic Cardiovascular Disease
5. Chronic Obstructive Pulmonary Disease
6. Malignancy
7. Liver Disease
8. Systemic Lupus Erythromatosus
Other: _________________________

APPENDIX C

FLUID KNOWLEDGE QUESTIONNAIRE

FLUID QUESTIONNAIRE

DIRECTIONS: READ EACH QUESTION CAREFULLY AND CIRCLE THE CORRECT ANSWER.

1. A dialysis patient should gain no more than 2 kilograms between dialysis sessions.

   T F

2. High blood pressure and congestive heart failure can result from fluid overload.

   T F

3. A dialysis patient is allowed to drink as much water as a regular person.

   T F

4. A kilogram is equal to 2.2 pounds.

   T F

5. Drinking water is the only way to relieve dry mouth.

   T F

6. Salt is restricted in dialysis patients because it makes you hold water.

   T F

7. Ice cream is not considered a fluid.

   T F

8. Coffee is a good substitute for water because it is not considered a fluid.

   T F

9. Cramps and nausea are a particular problem for the patient who is fluid overloaded.

   T F

10. The body can be described as a holding tank.

    T F

11. Tomatoes and watermelon are not considered fluids for the dialysis patient.

T F

12. Gravy does not add to my fluid level.

T F

13. Death can result from fluid overloading.

T F

14. A fluid is defined as anything that pours.

T F

15. A dialysis patient can never eat too much ice.

T F

16. A fluid is anything that is liquid at room temperature.

T F

17. A damp cloth or ice is a good way to relieve a dry mouth.

T F

18. Alcohol is okay for a dialysis patient to drink.

T F

19. Swelling of the hands, feet, and legs are bad side effects of too much fluid.

T F

20. Jello and even syrup can add to a dialysis patient's fluid level.

T F

APPENDIX D

SOCIAL SUPPORT QUESTIONNAIRE

SSQSR

Subject #:______ Date:____________

INSTRUCTIONS: The following questions ask about people in your environment who provide you with help or support. Each question has two parts. For the first part list all of the people you know whom you can count on for help or support in the manner described. Give the persons initials and their relationship to you (see example). For the second part, circle how satisfied you are with the overall support you have in each situation. If you have no support for a question, check the words "No one" and rate your level of satisfaction.

EXAMPLE:

With whom do you trust with information that could get you in trouble?

__No one	1) T.N. (brother)	4) T.N. (father)	7.
	2) L.M. (friend)	5) L.B. (employer)	8.
	3) R.S. (friend)	6)	9.

How satisfied?

6-very satisfied	5-fairly satisfied	4-a little satisfied	3-a little dissatisfied	2-fairly dissatisfied	1-very dissatisfied

1. Whom can you readily count on to be dependable when you need help?

__No one	1)	4)	7.
	2)	5)	8.
	3)	6)	9.

2. How satisfied?

6-very satisfied	5-fairly satisfied	4-a little satisfied	3-a little dissatisfied	2-fairly dissatisfied	1-very dissatisfied

3. Whom can you really count on to help you feel more relaxed when you are under pressure or tense?

__No one	1)	4)	7.
	2)	5)	8.
	3)	6)	9.

4. How satisfied?

6-very satisfied	5-fairly satisfied	4-a little satisfied	3-a little dissatisfied	2-fairly dissatisfied	1-very dissatisfied

5. Who accepts you totally, including your worst and best points?

__No one	1)	4)	7.
	2)	5)	8.
	3)	6)	9.

6. How satisfied?

6-very satisfied	5-fairly satisfied	4-a little satisfied	3-a little dissatisfied	2-fairly dissatisfied	1-very dissatisfied

7. Whom can you really count on to care about you, regardless of what is happening to you?

__No one	1)	4)	7.
	2)	5)	8.
	3)	6)	9.

8. How satisfied?

6-very satisfied	5-fairly satisfied	4-a little satisfied	3-a little dissatisfied	2-fairly dissatisfied	1-very dissatisfied

9. Whom can you really count on to help you feel better when you are feeling generally down-in-the dumps?

__No one	1)	4)	7.
	2)	5)	8.
	3)	6)	9.

10. How satisfied?

6-very satisfied	5-fairly satisfied	4-a little satisfied	3-a little dissatisfied	2-fairly dissatisfied	1-very dissatisfied

11. Whom can you count on to console you when you are very upset?

__No one	1)	4)	7.
	2)	5)	8.
	3)	6)	9.

12. How satisfied?

6-very satisfied	5-fairly satisfied	4-a little satisfied	3-a little dissatisfied	2-fairly dissatisfied	1-very dissatisfied

APPENDIX E

CENTER FOR EPIDEMIOLOGIC STUDIES
DEPRESSION SCALE

Name________________________ Date__________ Age_____ Sex Male Female

Pain State 0 1 2 3 4 5 6 7 8 9 10 Eval. Pre-Rx Post-Rx F.U.

CES-D

INSTRUCTIONS: Circle the number for each statement which best describes how often you felt this way DURING THE PAST WEEK.

	Rarely or None of the Time (Less than 1 Day)	Some or a Little of the Time (1-2 Days)	Occasionally or a Moderate Amount of Time (3-4 Days)	Most or All of the Time (5-7 Days)
1. I was bothered by things that usually don't bother me	0	1	2	3
2. I did not feel like eating; my appetite was poor	0	1	2	3
3. I felt that I could not shake off the blues even with help from my family or friends	0	1	2	3
4. I felt that I was just as good as other people	0	1	2	3
5. I had trouble keeping my mind on what I was doing	0	1	2	3
6. I felt depressed	0	1	2	3
7. I felt that everything I did was an effort	0	1	2	3
8. I felt hopeful about the future	0	1	2	3
9. I thought my life had been a failure	0	1	2	3
10. I felt fearful	0	1	2	3
11. My sleep was restless	0	1	2	3
12. I was happy	0	1	2	3
13. I talked less than usual	0	1	2	3
14. I felt lonely	0	1	2	3
15. People were unfriendly	0	1	2	3
16. I enjoyed life	0	1	2	3
17. I had crying spells	0	1	2	3
18. I felt sad	0	1	2	3
19. I felt that people disliked me	0	1	2	3
20. I could not get "going"	0	1	2	3

APPENDIX F

MULTIDIMENSIONAL HEALTH LOCUS OF CONTROL SCALE
FORM A

MHLC Form A

This is a questionnaire designed to determine the way in which different people view certain important health-related issues. Each item is a belief statement with which you may agree or disagree. Beside each statement is a scale which ranges from strongly disagree (1) to strongly agree (6). For each item we would like you to circle the number that represents the extent to which you disagree or agree with the statement. The more strongly you agree with a statement, then the higher will be the number you circle. The more strongly you disagree with a statement then the lower will be the number you circle. Please make sure that you answer every item and that you circle only one number per item. This is a measure of you personal beliefs; obviously, there are no right or wrong answers.

Please answer these items carefully, but do not spend too much time on any one item. As much as you can, try to respond to each item independently. When making your choice, do not be influenced by your previous choices. It is important that you respond according to your actual beliefs and not according to how you feel you should believe or how you think we want you to believe.

	Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree
1. If I get sick, it is my own behavior which determines how soon I get well again.	1	2	3	4	5	6
2. No matter what I do, if I am going to get sick, I will get sick.	1	2	3	4	5	6
3. Having regular contact with my physician is the best way for me to avoid illness.	1	2	3	4	5	6
4. Most things that affect my health happen to me by accident.	1	2	3	4	5	6
5. Whenever I don't feel well, I should consult a medically trained professional.	1	2	3	4	5	6
6. I am in control of my health.	1	2	3	4	5	6
7. My family has a lot to do with my becoming sick or staying healthy.	1	2	3	4	5	6
8. When I get sick, I am to blame.	1	2	3	4	5	6
9. Luck plays a big part in determining how soon I will recover from an illness.	1	2	3	4	5	6
10. Health professionals control my health.	1	2	3	4	5	6
11. My good health is largely a matter of good fortune.	1	2	3	4	5	6
12. The main thing which affects my health is what I myself do.	1	2	3	4	5	6
13. If I take care of myself, I can avoid illness.	1	2	3	4	5	6
14. When I recover from an illness, it's usually because other people (for example, doctors, nurses, family, friends) have been taking good care of me.	1	2	3	4	5	6
15. No matter what I do, I'm likely to get sick.	1	2	3	4	5	6
16. If it's meant to be, I will stay healthy.	1	2	3	4	5	6
17. If I take the right actions, I can stay healthy.	1	2	3	4	5	6
18 Regarding my health, I can only do what my doctor tells me to do.	1	2	3	4	5	6

APPENDIX G

TABLES 1-16

Table 1: Demographic/Medical Characteristics of Recruited Sample ($\underline{n}$ = 141)

Variable	M	SD	Range	Percent
Age (Years)	51.1	14.3	20-76	-
Months on Dialysis	39.5	41.7	3-276	-
No. Concurrent Diagnoses	1.71	0.97	0-4	-
Persons in Household	2.65	1.57	1-9	-
Job Status: Employed				10
Unemploy				90
Annual Income: < $10,000				65.2
$10,001 - 25,000				23.5
$25,000 - 50,000				8.5
> $50,001				2.8
Education Level: < H.S. Diploma				44.7
H.S. Diploma				29.1
> H.S. Diploma				26.2
Sex: Male				51.1
Female				48.9
Race: Black				80.1
White				19.9
Marital Status: Married				36.9
Single				63.1

Table 2: Participants Lost to Intervention Study

	CCG[a]	ACG[b]
Moved/Transferred	2	1
Transplant	1	1
Hospitalization	4	5
Death	3	3
Quit Study	9	17
	19	26

a = Contingency Contract Group b = Attention Control Group

Table 3: Simple Statistics for Experimental Variables

VARIABLE	MEAN	STD DEV	RANGE
IWG[a]	7.89	2.49	1.4-15.5
Fluid Knowledge	17.50	2.04	8-20
CES-D[b]	12.93	9.31	0-47
SSQS[c]	34.60	3.11	13-36
MHLCI[d]	26.42	7.22	6-36
MHLCCE[e]	19.57	8.11	6-36
MHLCPO[f]	25.91	7.00	10-36

a = Weekly Baseline of Intersession Weight Gain

b = Center for Epidemiological Studies - Depression Scale

c = Social Support Questionnaire - Short Form

d = Multidimensional Health Locus of Control (Internality)

e = Multidimensional Health Locus of Control (Chance Externality)

f = Multidimensional Health Locus of Control (Powerful Others)

Table 4: Pearson Correlation Coefficients of Intersession Weight Gain and Selected Predictor Variables (n=141)

		1	2	3	4	5	6	7	8	9	10	11
1	IWG[a]											
2	AGE	$-.17^{y}$										
3	Concurrent Dx	-.02	.05									
4	Sex (Male)	$.28^{x}$	-.05	-.08								
5	Fluid Knowledge	.07	$.27^{x}$	-.06	-.03							
6	CES-D[b]	$-.18^{x}$	-.14	.12	$-.20^{x}$	-.15						
7	SSQS[c]	-.02	.11	-.07	-.01	-.03	$-.23^{x}$					
8	MHLCI[d]	.09	.10	-.05	.06	.03	-.05	$.25^{x}$				
9	MHLCCE[e]	.13	.11	-.03	-.08	-.10	-.04	.15	$.38^{x}$			
10	MHLCPO[f]	-.02	.29	.12	.02	.10	.04	.12	$.44^{x}$	$.41^{x}$		
11	Education	.11	-.04	-.08	.10	$.20^{x}$	-.01	-.08	-.07	$-.45^{x}$	$-.35^{x}$	
12	Mos on Dialysis	-.09	.03	-.01	.08	.06	.01	.05	-.07	-.12	.01	-.01

x = ($\underline{p}<.01$) y = ($\underline{p}<.05$)

a = Weekly Baseline of Intersession Weight Gain

b = Center for Epidemiological Studies - Depression Scale

c = Social Support Questionnaire - Short Form

d = Multidimensional Health Locus of Control (Internality)

e = Multidimensional Health Locus of Control (Chance Externality)

f = Multidimensional Health Locus of Control (Powerful Others)

Table 5: Stepwise Regression Results for Predictor Variables and Fluid Noncompliance

Source	df	Sum of Sqs	Mean Sq	F	p	R^2
Model	4	136.146	34.04	6.30	.0001	.17
Error	136	735.028	5.40			
C Total	140	871.174				

Step	Variable	Partial R^2	Mult R^2	F	p
1	Sex (Male)	.08	.08	11.51	.001
2	Age	.03	.11	3.97	.048
3	MCLCCE[a]	.03	.14	4.18	.043
4	Education	.03	.17	4.41	.037

a = Multidimensional Health Locus of Control (Chance Externality)

Table 6: Intervention Study Group Demographics

	CCG[a] ($\underline{n}$=53)		ACG[b] ($\underline{n}$=43)	
	$\underline{M}$	$\underline{SD}$	$\underline{M}$	$\underline{SD}$
Age (Years)	50.6	15.15	48.9	13.41
No. Concurrent Diagnoses	1.68	.87	1.56	.91
Months on Dialysis	44.79	49.38	32.63	26.54
Persons in Household	2.62	1.77	2.77	1.62
IWG	7.40	2.28	7.70	2.62
Fluid Knowledge	17.75	1.89	17.20	2.31
CES-D	13.42	9.14	13.86	10.41
SSQS	34.72	2.71	35.12	1.97
MHLC Internal	26.13	7.37	26.56	7.36
MHLC Chance External	19.11	7.84	19.14	8.21
MHLC Powerful Others	25.42	7.27	25.79	7.24
	Freq		Freq	
Sex: Female	28		22	
Male	25		21	
Job Status: Employed	7		2	
Unemployed	46		41	
Marital Status: Single	19		21	
Married	34		22	

Table 7: Analyses of Variance Results Comparing Groups at Baseline for Intervention Study

CCG[a] (n=53) ACG[b] (n=43)

	F	p
Age (Years)	1.28	.41
Concurrent Diagnoses	1.08	.78
Months on Dialysis	3.46	.001
Persons in Household	1.20	.55
IWG	.37	.54
Fluid Knowledge	1.52	.16
CES-D	1.42	.24
SSQS	.11	.74
MHLC Internal	.10	.75
MHLC Chance External	.22	.64
MHLC Powerful Others	.37	.54

a = Contingency Contract Group b = Attention Control Group

Table 8: Frequencies of Participants in Each Group Who Met Intersession Weight Gain Criteria*

		BSLN	1MO	6MO	F/U
CCG[a]	Compliant	23	26	23	26
	Noncompliant	30	27	30	27
ACG[b]	Compliant	18	17	12	10
	Noncompliant	25	26	31	33

* = Criteria of weekly IWG equal or less than 7.00 kg

a = Contingency Contract Group   b = Attention Control Group

Table 9: Reinforcement Rates for Contingency Contract Group (n=53)

Value[a]	Count[b]	Cum %	Value	Count	Cum %	Value	Count	Cum %
0	3	5.7	7	3	45.3	16	1	75.5
1	2	9.4	10	4	52.8	17	5	84.5
2	3	15.1	11	1	54.7	18	3	90.6
3	4	22.6	12	3	60.4	19	2	94.3
4	3	28.3	13	2	64.2	20	3	100.0
5	5	37.7	14	3	69.8			
6	1	39.6	15	2	73.6			

a = Number of raffle tickets earned by a subject during treatment

b = Number of subjects

Table 10: One Way ANOVA Group Comparisons of

Intersession Weight Gain

Baseline

Source	df	Sum of Sqs	Mean Sq	F	p
Model	1	2.231	2.231	0.37	.54
Error	94	560.409	5.962		
C Total	95				

562.639

1 Month Treatment:

Source	df	Sum of Sqs	Mean Sq	F	p
Model	1	0.319	0.319	0.05	.82
Error	94	608.927	6.478		
C Total	95	609.247			

6 Month Treatment:

Source	df	Sum of Sqs	Mean Sq	F	p
Model	1	7.697	7.697	1.07	.30
Error	94	675.971	7.191		
C Total	95	683.667			

1 Month Follow Up:

Source	df	Sum of Sqs	Mean Sq	F	p
Model	1	6.237	6.237	1.11	.29
Error	94	530.282	5.641		
C Total	95	536.519			

Table 11: One Way ANOVA Group Comparisons of Center for Epidemiologic Studies Depression Scale

Baseline:

Source	df	Sum of Sqs	Mean Sq	F	p
Model	1	127.280	127.280	1.42	.24
Error	72	6442.623	89.481		
C Total	73	6569.901			

1 Month Treatment:

Source	df	Sum of Sqs	Mean Sq	F	p
Model	1	3.28	3.280	0.04	.84
Error	72	6166.626	85.648		
C Total	73	6169.905			

6 Month Treatment:

Source	df	Sum of Sqs	Mean Sq	F	p
Model	1	35.114	35.114	0.44	.51
Error	72	5689.048	79.015		
C Total	73	5724.162			

1 Month Follow Up:

Source	df	Sum of Sqs	Mean Sq	F	p
Model	1	165.771	165.771	2.01	.16
Error	72	5950.512	82.646		
C Total	73	6116.284			

Table 12: One Way ANOVA Group Comparisons of MHLCI*

Baseline:

Source	df	Sum of Sqs	Mean Sq	F	p
Model	1	6.621	6.621	0.10	.75
Error	70	4457.254	63.675		
C Total	71	4463.875			

1 Month Treatment:

Source	df	Sum of Sqs	Mean Sq	F	p
Model	1	3.631	3.631	0.06	.81
Error	70	4502.688	64.324		
C Total	71	4506.319			

6 Month Treatment:

Source	df	Sum of Sqs	Mean Sq	F	p
Model	1	3.000	3.000	0.06	.80
Error	70	3499.874	49.998		
C Total	71	3502.875			

1 Month Follow Up:

Source	df	Sum of Sqs	Mean Sq	F	p
Model	1	13.897	13.897	0.24	.63
Error	70	3985.756	56.939		
C Total	71	3999.653			

* = Multidimensional Health Locus of Control - Internality

Table 13: One Way ANOVA Group Comparisons of MHLCCE*

Baseline:

Source	df	Sum of Sqs	Mean Sq	F	p
Model	1	15.482	15.482	0.22	.64
Error	70	4846.393	69.234		
C Total	71	4861.875			

1 Month Treatment:

Source	df	Sum of Sqs	Mean Sq	F	p
Model	1	19.495	19.495	0.26	.61
Error	70	5270.380	75.291		
C Total	71	5289.875			

6 Month Treatment:

Source	df	Sum of Sqs	Mean Sq	F	p
Model	1	13.477	13.477	0.22	.64
Error	70	4329.634	61.852		
C Total	71	4343.111			

1 Month Follow Up:

Source	df	Sum of Sqs	Mean Sq	F	p
Model	1	47.678	47.678	0.62	.44
Error	70	5417.974	77.400		
C Total	71	5465.653			

* = Multidimensional Health Locus of Control - Chance Externality

Table 14: One Way Anova Group Comparisons of MHLCPO*

Baseline:

Source	df	Sum of Sqs	Mean Sq	F	p
Model	1	21.242	21.242	0.37	.54
Error	70	3979.078	56.844		
C Total	71	4000.320			

1 Month Treatment:

Source	df	Sum of Sqs	Mean Sq	F	p
Model	1	1.872	1.872	0.03	.87
Error	70	4934.072	70.486		
C Total	71	4935.944			

6 Month Treatment:

Source	df	Sum of Sqs	Mean Sq	F	p
Model	1	80.774	80.774	1.58	.21
Error	70	3572.212	51.032		
C Total	71	3652.986			

1 Month Follow Up:

Source	df	Sum of Sqs	Mean Sq	F	p
Model	1	15.273	15.273	0.26	.61
Error	70	4082.380	58.320		
C Total	71	4097.652			

* = Multidimensional Health Locus of Control - Powerful Others

Table 15: Intervention Study Simple Statistics for

Contingent Contract Group (CCG) / Attention Control Group (ACG)

Variable	MEAN	SD	Range
IWG[a] Bsln	7.40 / 7.70	2.28 / 2.62	1.40-12.90 / 2.60-15.50
IWG 1 Mo	7.64 / 7.52	2.72 / 2.31	3.60-17.67 / 3.05-13.45
IWG 6 Mo	7.73 / 8.30	2.73 / 2.62	1.45-16.95 / 2.97-14.73
IWG F/U	7.72 / 8.23	2.29 / 2.48	2.52-12.60 / 3.03-11.88
Variable	**MEAN**	**SD**	**Range**
CES-D[b] Bsln	13.42 / 13.86	9.14 / 10.41	0-47 / 0-39
CES-D 1 Mo	13.14 / 11.23	8.63 / 10.25	0-34 / 0-39
CES-D 6 Mo	13.45 / 13.11	7.72 / 10.52	0-34 / 0-42
CES-D F/U	10.42 / 13.37	7.15 / 11.33	0-28 / 0-41

a = Weekly Baseline of Intersession Weight Gain

b = Center for Epidemiological Studies - Depression Scale

Table 16: Intervention Study Simple Statistics (continued) for Contingent Contract Group (CCG) / Attention Control Group (ACG)

Variable	MEAN	SD	Range
MHLC-I[d] Bsln	26.13 / 26.56	7.37 / 7.36	8-36 / 6-36
MHLC-I 1 Mo	24.92 / 24.63	8.20 / 7.39	6-36 / 6-36
MHLC-I 6 Mo	25.16 / 25.00	6.88 / 6.39	10-36 / 10-36
MHLC-I F/U	24.20 / 24.97	7.21 / 7.99	7-36 / 6-36
Variable	MEAN	SD	Range
MHLC-CE[e] Bsln	19.11 / 19.14	7.84 / 8.21	6-34 / 6-36
MHLC-CE 1 Mo	20.02 / 20.86	8.79 / 8.06	6-36 / 6-36
MHLC-CE 6 Mo	21.47 / 21.95	8.20 / 6.60	6-36 / 10-36
MHLC-CE F/U	20.64 / 22.31	9.67 / 7.06	6-36 / 6-36
Variable	MEAN	SD	Range
MHLC-PO[f] Bsln	25.42 / 25.79	7.27 / 7.24	6-34 / 6-36
MHLC-PO 1 Mo	25.02 / 24.77	8.35 / 8.12	6-36 / 6-36
MHLC-PO 6 Mo	26.00 / 24.03	6.18 / 7.68	6-36 / 10-36
MHLC-PO F/U	25.70 / 24.76	7.89 / 7.08	6-36 / 6-36

d = Multidimensional Health Locus of Control (Internality)

e = Multidimensional Health Locus of Control (Chance Externality)

f = Multidimensional Health Locus of Control (Powerful Others)

APPENDIX H

PERMISSION TO USE COPYRIGHT MATERIAL

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Department of Psychology, NI-25
FAX (206) 685-3157

May 7, 1992

Mr. Kevin Everett
64 B Village Green N.
East Providence, RI 02915

Dear Mr. Everett:

As you requested by phone today, you have my permission to use the brief version of the Social Support Questionnaire in your dissertation.

Good luck!

Sincerely,

Irwin G. Sarason
Professor and Chair

bj

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Alcohol, Drug Abuse, and
Mental Health Administration
Rockville MD 20857

May 6, 1992

Dear Colleague:

Thank you for your inquiry regarding the CES-D Scale. We are always happy to have the scale used by qualified researchers. The scale is in the public domain, therefore, it may be used without copyright permission.

If the CES-D scale is used in your study or research, we would appreciate receiving copies of your results. We are trying to maintain records of the scale's effectiveness and the various areas in which it is most useful.

Please feel free to call us if you have any questions. Our number is (301) 443-3774.

Sincerely,

Karen Bourdon

Epidemiology & Psychopathology
Research Branch
Division of Clinical Research
National Institute of Mental Health

Enclosures

VANDERBILT UNIVERSITY

NASHVILLE, TENNESSEE 37240

Telephone (615) 322-7311

Health Care Research Project * School of Nursing * Direct Phone 343-3317

To: Fellow Health Researcher
From: Kenneth A. Wallston, Ph.D.

Thank you for your interest in the Health Locus of Control Scales. Please excuse this form response, but I have so many inquiries requiring similar replies that I have found this to be an efficient means of disseminating information.

You have my permission to utilize Form A or B of the MHLC scales in any health related research you are doing. My only request is that you keep me informed of any results you obtain using the scales. In that way I hope to continue to serve as a clearinghouse for information about the scales.

We have recently developed Form C of the MHLC scales, an instrument which can easily be made specific to any existing medically-related condition which your subjects might have (e.g., diabetes, cancer, high blood pressure, migraine headaches, arthritis, chemical dependencies, etc.) We have used Form C as an "Arthritis Locus of Control Scale" and are generally pleased with its psychometric properties. If you think such an instrument would be helpful in your research and if you are willing to share your data back with us, we would be pleased to make it available to you.

If you wish us to send you additional material, please complete and return the enclosed form. For most items there is a small charge to cover duplication and postage.

If you have more specific questions, don't hesitate to contact me. Please remember to send me information on any use you make of these scales. I have included a usage questionnaire to facilitate your doing so. I look forward to hearing from you.

P.S. I have enclosed a copy of a brief article I just wrote on the importance of placing measures of Health Locus of Control in a Theoretical Context. I hope you find it interesting and stimulating.

8/90

VITA

Kevin D. Everett was born in Oklahoma City, Oklahoma. He was awarded a B.A. in Psychology and Biology at the University of Missouri in 1986. He is currently a candidate for Ph.D. in Clinical Psychology at Louisiana State University, having completed an M.A. in Psychology in 1989. Following a clinical psychology internship in 1992 at the Brown University Psychology Internship Consortium, he will serve as a project director and postdoctoral fellow at Butler Hospital in Providence, Rhode Island.

DOCTORAL EXAMINATION AND DISSERTATION REPORT

Candidate: Kevin D. Everett

Major Field: Psychology

Title of Dissertation: Improving Long-term Adherence to Fluid Restrictions in Hemodialysis Patients

Approved:

Phillip J. Brantley

Major Professor and Chairman

Dean of the Graduate School

EXAMINING COMMITTEE:

W. D. Gouvier

A. J. Puente

William F. Waters

Date of Examination:

June 15, 1992